Library of the Marine Corps
3000180234

DS
79.72
.083
1993

MARINE CORPS UNIVERSITY LIBRARY

DIRECTOR, MARINE CORPS RESEARCH CENTER
ATTN: COLLECTION MANAGEMENT (C40RCL)
MCCDC
2040 BROADWAY ST
QUANTICO VA 22134-5107

#39002112

DS
79.72
.083
1993
QmCH

MARINE
PERSIAN GULF
410

SAND AND STEEL

LESSONS LEARNED ON U.S. MARINE CORPS ARMOR AND ANTI-ARMOR OPERATIONS FROM THE GULF WAR

by

ROBERT E. OSBORNE
SSGT USMCR

MARINE CORPS LESSONS LEARNED
SYSTEM DATA BASE SECTION
INTEGRATION DIVISION
MARINE CORPS COMBAT DEVELOPMENT COMMAND

TABLE OF CONTENTS

CHAPTER	SUBJECT	PAGE
I.	INTRODUCTION	1
II.	HISTORY OF ARMORED WARFARE	2
	A. ARMOR	2
	1. ARMOR IN WORLD WAR I	2
	2. INTER-WAR YEARS	3
	3. ARMOR IN WORLD WAR II	4
	4. ARMOR IN KOREA	4
	5. ARMOR IN VIETNAM	5
	B. ANTI-TANK WARFARE	6
	C. CONCLUSION	6
III.	OVERVIEW: U.S. MARINE CORPS OPERATIONS IN SOUTHWEST ASIA	7
	A. MOVING TO THE GULF	7
	B. USMC FORCE ORGANIZATION	7
	C. THE AIR WAR	8
IV.	THE KTO TACTICAL ENVIRONMENT	11
	A. GENERAL	11
	1. ENVIRONMENTAL ASPECTS	11
	2. TACTICAL SIGNIFICANCE	11
	a. TERRAIN AND WEATHER	11
	3. MARINE ARMOR TACTICAL CONSIDERATIONS	13
V.	OVERVIEW OF MARINE ARMOR IN DESERT STORM	14
	A. GENERAL	14
	B. USMC ARMOR AND ANTI-ARMOR EQUIPMENT	14
	1. THE M1A1 TANK	14
	2. THE M60 TANK	15
	3. TOW WEAPON SYSTEMS	15
	4. LIGHT ARMORED INFANTRY VEHICLE	18
	5. THE MINE PLOW	19
	6. NIGHT SIGHTS	19
	7. VEHICLE IDENTIFICATION	21
	8. APPLIQUE CONSIDERATIONS	21
	9. WEAPONS CONSIDERATIONS	22
	10. INTELLIGENCE CONSIDERATIONS	22
	C. MEF TRAINING	23
	1. COMMUNICATIONS	24
	2. EFFECTIVE FIRE SUPPORT	24
	D. TARGET ACQUISITION	25
	E. GROUND OPERATIONS	26
III.	OVERVIEW: U.S. MARINE CORPS OPERATIONS IN SOUTHWEST ASIA	29
	A. MOVING TO THE GULF	29
	B. USMC FORCE ORGANIZATION	32
	C. THE AIR WAR	34

VI. IRAQI MILITARY EQUIPMENT AND PERFORMANCE 31
A. GENERAL 31
B. SIZE 31
C. STRATEGY AND TACTICS 31

VII. U.S. LOGISTICAL SUPPORT ISSUES 34
A. GENERAL 34
1. FUEL ISSUES 34
2. SUPPLY/RE-ORDER EQUIPMENT 35
3. CVC GEAR 35
4. AMMO ALLOWANCES 35
5. MPS OFF LOAD 36

VIII. U.S. MARINE RESERVES PERFORMANCE 37
A. GENERAL 37

IX. NUCLEAR, BIOLOGICAL, CHEMICAL 39
A. GENERAL 39

X. CONCLUSIONS 40
A. RECOMMENDATIONS FOR GROUND OPERATIONS 41

Appendix
A. Glossary 43
B. Geographical Glossary 44
C. Index of Names in This Report 45

Bibliography 46
Footnotes 47

I. INTRODUCTION

At 0430 on 2 August, 1990, over 600 armored vehicles from the Iraqi army raced across Kuwait, spearheading an unprovoked Iraqi invasion and occupation. Over the next several months, the United States mobilized its largest military force since the Vietnam War, and responded to the latest crisis in international security by leading a multinational force against Iraqi aggressors--reputedly the fourth largest army in the world. The long-awaited Gulf War had begun.

While this study is not a complete history of Marine armor in Southwest Asia (SWA), its narrative focuses on armor and anti-armor lessons learned by discussing their role and effectiveness in operations conducted by the Marine Expeditionary Forces (MEF) during the Gulf War, and anthologizes only those units whose mission was to fight in a mounted fashion. The following topics are explored:

II. HISTORY OF ARMORED WARFARE

A. Armor

While the true origin of modern armor and anti-armor may only be found in antiquity, any thoughtful analysis of the history of armor must logically begin with the dream of the ancient warrior for speed, protection, and some form of offensive weapon on the field of battle.

While the Chinese claim that they were using chariots and four-wheeled carts as early as 2600 B.C., the first written record of mobile armored warfare is actually some 3,000 years old and chronicles the wooden wheeled carts in Mesopotamia. These earliest vehicles were used to bring fresh troops to the battlefield, giving those who used them clear superiority over enemy foot soldiers. Over the course of time, the cart evolved into a fighting platform when the two-wheeled chariot -- probably of Hurrian origin -- appeared to dominate warfare throughout the Middle East.[1]

The chariot ultimately fell into disuse, although the Assyrians had built their powerful armies around the capability of the chariots between 1100 and 670 B.C., and, in an early version of combined arms operations, they learned to attach inflated goat skins to the chariots to act as pontoons when rivers impeded their assault. With the development and widespread use of metals, soldiers began to demand the greater personal protection of metal armor. Consequently, the added weight of metallic armored protection and the introduction of heavy, crude firearms made the traditional warfare using the horse quite prohibitive. Later, Zizka, a half-blind Hussite from a Central European religious sect, revived the use of a *war wagon*, which used heavily timbered sides for protection and ports through which crossbowmen could fire. When attacked in open ground, Zizka could repel any assaulting force by forming his war wagons into a circle.[2]

Later, a crude form of firearm was introduced in battle, and the inevitable combination of mobility, protection, and firepower was born. This new hope for the battlefield was later described in 1482 by the great Leonardo da Vinci, who wrote; "I am building secure and covered chariots which are invulnerable, and when they advance with their guns in the midst of the foe even the largest enemy masses must retire and behind these chariots the infantry can follow in safety." [3]

The dreams of the early warriors for more devastating weapons combined with troop protection would not truly be realized for several hundred years, not until the nineteenth century, and the introduction of the power driven vehicle. With the appearance of those vehicles in World War I, the basic elements of armored warfare -- mobility, firepower, and protection -- were finally realized in the form of the first modern armored vehicle.

1. Armor In World War I

Modern armor, as we know it, actually begins with World War I, and is almost entirely a British story, since Great Britain is credited with the development of the modern "tank", as it came to be called. When British Lieutenant H. W. Mortimer moved his tank onto the battlefield during the Battle of the Somme, in September, 1916, the strange and crudely designed mechanized armored vehicle was

heralded as the most efficient way to overpower the enemy without a prolonged battle of attrition. Although the vehicle was awkward, had difficulty breaching obstacles, and was subject to frequent breakdowns, it is clear that the development of the tank helped to revolutionize modern warfare.[4]

Despite the problems which accompanied the employment of the tank, the Germans were truly startled by the strangely shaped tracked vehicle crossing no-man's land toward them. In fact, a captured and shocked German officer insisted to his captors that the use of tanks by the British was "not war, but bloody butchery."[5]

During the Battle of Cambrai, in 1917, the British used over 100 tanks to successfully break a strongly entrenched German line of defense, and succeeded in its effort to break the deadlock of trench warfare. That single dramatic event confirmed Cambrai's rightful claim as the birthplace of modern armor on the battlefield, and contributed significantly to ending the Great War.[6] Despite armor's iconoclastic role in the war, there was little widespread effort during the post-war years to capitalize on the recent victory. It is apparent, however, that the defeated German forces would not soon forget that dramatic introduction of armor, an occurrence which set the stage for the significant post-war study of armor as a viable offensive weapon system.[7]

2. The Inter-War Years

The post-war era, 1919-1939, was characterized by worldwide political and economic reorganization, and the future of armor development fell in the hands of a few strong proponents who advocated its importance to all who would listen. But, armor development began to stagnate, despite the fervent pleas of armor proponents, and neither England, France, nor Russia wanted to consider armor an instrument of "operative" warfare. While the tank was gratefully accepted as an infantry escort, the concept of using armor as a completely new kind of offensive weapon seemed to elude most military forces, despite the development of new tactics which quickly demonstrated that the tank could restore fluidity, mobility, and maneuver to the battlefield. As Liddell Hart has pointed out, "Armies learn only from defeat. That explains why an army which has been victorious in one war so often loses the next.[8]

The United States military in the post-World War I era was also characterized by isolationism, reorganization, and retrenchment. However, over the "peaceful" years of the 1920s and 1930s, some forward thinkers in the Marine Corps did take time to examine both the successes and failures of the Great War, including the use of armor. Development of armor among all U.S. and allied forces at this time evolved partly as a result of the efforts of those few strong personalities who espoused the use of the new weapons, and partly out of a fear that the expanding German forces would develop more superior armored weapon systems and tactics.[9]

In Germany, the rebuilding years from 1919 until 1934 was called the "tankless times," and a vigorous struggle by champions of armor took place in the German Reichsheer for an "operative" armor theory. Guderion and his followers fought continually for a more operative role for armor, with deep penetrations, flanking movements, and encirclements, as opposed to the more conservative view that armor should be placed under the infantry. Still smarting from their devastating losses in World War I, the best German military minds of the time realized the value of tanks as a "shock weapon," and cultivated an armored doctrine which would evolve into the infamous blitzkrieg campaigns of 1939-1941. [10]

The U.S. Marine Corps, in those pre-World War II years, continued to view the tank as a *moving pillbox*. While the tank was rather reluctantly embraced as a potential offensive tool, the Marine Corps did employ the light tank in numerous exercises leading up to the outset of World War II, exercises that proved the value of armor's role in amphibious warfare.[11]

3. Marine Armor In World War II

The persistent efforts of proponents of Marine Corps armor employment during the 1930s produced the fielding of a light tank, the M3 Stuart, equipped with both .30 and .50 caliber machine guns. Each of the two Marine Divisions of the day boasted one company of these new weapons. At the landing on Guadalcanal, Marines were equipped with the M3 Stuart, but as the war progressed, a medium tank battalion of M4 Sherman tanks, armed with 75mm guns, joined each amphibious corps. Each of the four medium tank companies in a Marine medium tank battalion were equipped with 17 Sherman tanks.[12]

In 1944, these tank companies expanded into a tank battalion for each division, with the division light companies becoming the fifth company and reequipped with the more heavily armored and more reliable M5 Stuart light tank. As the war entered its final stage, the Marine Corps learned that the light tank was unable to breach the strongly fortified Japanese bunkers, and eventually went to the M4A4 Shermans and 105mm Howitzers to give more explosive firepower in attacking enemy bunkers and cave defenses.[13]

By the end of World War II, Marine tanks were task organized for embarkation, landing, and for combat ashore by assigning a medium tank company to each regimental combat team, which also consisted of an infantry regiment, artillery battery, engineer company, and other supply elements. The Marine Corps had finally made armored units a permanent feature of its combat strategy, although post-war euphoria once again resulted in a total force reduction, and reducing the Marine Corps' level of readiness to carry out its mission for the impending conflict in Korea.[14]

4. Marine Armor In Korea

By the beginning of the Korean War, the Marine Corps, like all U.S. military services, had suffered a serious erosion of its World War II top level strength. From a peak of half a million men in 1945, the Corps had dropped to 75,000 men by 1950. When the North Koreans attacked South Korea on Sunday, 25 June, 1950, the Marine Corps consisted of two understrength and underequipped divisions.

On 2 August, the 1st Marine Brigade came ashore at the Port of Pusan with 6,500 troops, equipped with a company of M-26 Pershing tanks. In a situation analogous to the deployment of Marines to Southwest Asia in 1990, Marines in 1950 were rapidly deployed, and had little time to train on the tanks which they had received days prior to leaving the United States. While the employment of Marine armor in Korea followed the prevailing doctrine of the day of using armor as mere *moving pillboxes*, Marine Pershing tanks almost immediately engaged and destroyed several North Korean T-34 tanks, previously thought to be invincible, in a vicious tank battle at Obong-ni Ridge. This was the beginning of a long successful utilization of Marine tanks to stop enemy advances all along the Naktong River. Finally, the Marines were withdrawn from the Pusan Perimeter to prepare for the Inchon landing.

Despite the ardor with which General Douglas McArthur conceived and planned the invasion at Inchon, Marine Corps planners soon learned that the region possessed many natural barriers to invasion by

infantry or mechanized troops. Although the Inchon landing was arguably the most difficult amphibious operation ever to be undertaken by the Marine Corps, Marine armor finally landed successfully at Green Beach, the only site free of unstable mud flats.[15]

After the cease fire in Korea, armor development focused on the European theater and the way it could be used by U.S. military forces to meet the potential Soviet threat to western security. As the United States drew closer to large scale involvement in Vietnam, very little serious thought was given to wide scale armor use in a Southeast Asia land war.[16]

5. Marine Armor In Vietnam

While the U.S. military learned much from the French Army's disastrous infantry and armor experiences in Vietnam, most observers of the early years of our involvement in the war in Southeast Asia maintained that the war was not "tank country," that it was strictly an infantry and Special Forces type contest, with little substantive role for armored units.[17]

By 1965 when the U.S. expected Viet Cong and North Vietnamese Army (NVA) forces to overrun Da Nang, a combined arms action began in earnest with air and sea strikes against the enemy. Despite the absence of any U.S. Military Assistance Command Vietnam (MACV) plans to employ armor in combat, the U.S. Marine Corps had the distinction of introducing the first American armored units in Vietnam.

In reality the presence of Marine armor in Vietnam was an "accident," because U.S. military planners did not realize that Marine battalion landing teams included a tank platoon. Despite their unanticipated arrival, the first Marine armored unit arrived in Vietnam when elements of the 3d Platoon, Company B, 3d Marine Tank Battalion rolled their M48A3 tanks onto Red Beach 2 at Da Nang on 8 March, 1965. By the end of the year, virtually the entire 1st Marine Tank Battalion was in Vietnam, joining the 3rd Tanks as the only Marine Tank units deployed to Southeast Asia prior to the withdrawal of Marine armored units in 1969.

When Marine armor arrived in Vietnam, its primary mission was to support infantry, act as anchors in strong points, and to assist in search missions and patrols. It was not until August 1965, when Marine tanks participated in *Operation Starlite* the first major battle in Vietnam which involved armored units that the tank units proved their value. During the battle, Marine armor provided badly needed firepower in a spoiling attack against a strong Vietcong force mustering in the Da Nang area. Despite its successes in that operation, the Marine use of armor was castigated as being "not appropriate to counter-insurgency operations," and no attempt was made to build on that success.[18]

Several different armored vehicles were used by the Marines in Vietnam, such as the M48 A3 tank, outfitted with a 90mm gun and two machine guns; the M67 tank, which employed a flame thrower in place of the cannon; and the Ontos and LVTP-5's, which each performed as back-ups for the tanks. The Ontos was an armored, fully-tracked vehicle with six 106mm recoilless rifles, and a .30 caliber machine gun for close-in defense. The LVTP-5 Amtrac performed effectively as a Marine general assault, personnel/cargo carrier, and mine and obstacle clearing vehicle.[19]

Before all Marine Corps armored units were pulled out of Vietnam in 1969, Marine armor *did* participate in numerous operations. In such battles as Khe Sanh, tanks provided mobile support. At Hue, the M-48s and the Ontos were committed to provide cover fire for Marines facing heavily armed

and well-entrenched enemy forces. Ultimately, Marine armored units became the main defense force along the Demilitarized Zone. The primary employment of Marine armor in Vietnam, however, was still the support of ground forces.[20]

Although the presence of Marine tanks in the Republic of Vietnam was unanticipated, U.S. military planners eventually conceded their value; tanks were capable of moving through jungle terrain. Unfortunately, memories of the classic *tank vs tank* battles from World War II European theater operations obscured an evaluation of tank use in Vietnam, and armor reverted to its original 1916 role of supporting infantry. Overall, Marine tank forces fought well and were an outstanding asset to the Vietnam war effort, despite the high level resistance to the use of armor in Vietnam. Out of those experiences, the Marine Corps learned to improvise, to fight for armor's role in offensive operations, and in the final analysis, learned many valuable lessons about the employment of armored forces in an unexpected tactical arena.

B. Anti-Tank Warfare

The corollary of the concept of the offensive use of armor is, of course, anti-armor defense. From the very infancy of armored warfare, every new development in armor tactics and technology has been followed by a demand for the developing a means to counter them, and the task for disabling the tank generally falls to the employer of anti-tank weapons systems. During World War I, the Germans learned to employ heavy artillery against armored units. Next, armor-piercing rifles and rifle rounds were developed. Ironically, in the years following WW I, little need was seen by allies for the development of anti-armor devices, and consequently a complacent attitude prevented the improvement of anti-armor capability.[21]

It was not until the evolution of microelectronics in the 1960s and 1970s, however, that anti-armor development advanced dramatically, and the first truly automated battlefield was born. The computer technology, microelectronics, and robotics which had revolutionized the use of armor on the modern battlefield also created a need to continue the development of more sophisticated anti-tank weaponry systems.[22]

One of the most successful systems employed by the Marine Corps in the Gulf War was the Tube Launched, Optically Tracked, Wire Guided (TOW) weaponry system. The TOW was developed in 1970 and found immediate acceptance with immediate use in Vietnam and in the Middle East. Cheap and highly effective, many nations have adopted the TOW as an anti-armor device. One reason for the success of the TOW II in Southwest Asia was its exceptional effective range of 3,750 meters.[23]

C. Conclusions

From its first appearance in modern warfare during the first World War, the tank has been in a constant state of transition, with new innovations in technology and tactics emerging in response to specific battlefield needs. The evolution of the tank has also resulted in the development of anti-armor weapons according to a "threat-response" pattern; that is, as new innovations in armor appear, new anti-armor weaponry systems have been developed to counter each newly developed threat.

III. OVERVIEW OF U.S. MARINE CORPS OPERATIONS IN SOUTHWEST ASIA

A. Moving To The Gulf

Operation Desert Storm was officially underway at 0230 hours 16 January 1991 and the campaign to liberate Kuwait was at last launched. Although the Marine Corps had been assigned a secondary role of mounting a "supporting attack" to tie down Iraqi forces in Kuwait, one of the most explosive and electrifying campaigns in Marine Corps history followed a 163-day positioning and preparation period that the world knew as Operation Desert Shield. (For Map of Iraq and Kuwait, see p. 23)

The spark that ignited the Gulf War, and launched the Marine Corps involvement in the Kuwait Theater of Operations (KTO), was Iraq's successful invasion of Kuwait. Kuwait's hopelessly outgunned military had been surprised by a well-coordinated Iraqi attack across an unguarded Kuwait border, and by 3 August 1990, the Iraqi army was in control of Kuwait's primary natural resource, its oil. The ultimate destruction of Kuwait's oil industry was one of Iraqi President Saddam Hussein's primary goals, and over a five month period, Iraqi forces detonated explosive charges damaging 749 of Kuwait's 1,330 active oil and gas wells.[24]

In response to the wanton torture, kidnapping, rape, and murder of Kuwaiti citizens by invading Iraqi forces, the United States led one of the largest multinational coalitions in history to deter further Iraqi aggression. During the Gulf War, the U.S. military forces were substantially supported by many nations who supported its massive deployment. Britain and France sent a significant number of aircraft, ships, and troops to the Gulf, while other European countries provided tactical aircraft and ships. Czechoslovakia and Hungary sent noncombat forces, such as transportation units or medical personnel, and many Islamic countries, such as Egypt and Syria, lent their support with substantial armored units.[25] In addition to the massive build-up by allied forces, it was quickly acknowledged that the allies held several clear tactical advantages over the Iraqis. The most important of these was the complete unanimity among the coalition forces that aggression by Iraq should be boldly answered.

With the Iraqi invasion, the U.S. Marine Corps immediately began a massive deployment of its forces to Southwest Asia to answer the Iraq's blatant threat to world peace. "Nearly 90 percent of the operational forces of the Marine Corps ...deployed simultaneously by the time of the cease-fire, the number of Marines deployed had grown to 92,000 Marines."[26] That force, which has been described as the largest Marine Corps deployment in its history, included a total of 24 infantry battalions, 19 fixed-wing and 21 helicopter squadrons. Also included were the associated command elements, combat support, combat service support organizations required to support a MEF ashore on the Arabian Peninsula, two Marine Expeditionary Brigades (MEB), and a Marine Expeditionary Unit (MEU) afloat in the Persian Gulf.[27]

B. U.S. Marine Corps Force Organization

The organizing of the Marine Corps force was as complicated as it was immense. Marine Corps Central (MarCent) was formed by units that were serving all four Marine Divisions and air wings. The units were composited to form a I MEF of two reinforced divisions, an enlarged air wing, which was in effect two Force Service Support Groups (FSSGS). A two-brigade plus amphibious force afloat operated under Navy Central (NavCent) until elements were committed.[28] The intensive build-up of

Marine units had the result of assuring a capable ground defense, validating the compositing of forces into a strong I MEF concept. Additionally, its joint force make-up seemed to predict the future direction of modern warfare, which most military analysts would agree suggests that successful combatants must learn to operate in a joint force environment in order to survive.

While the world waited for the ground offensive to begin on G-Day, 24 February, first blood in a ground campaign was drawn on 29 January, when Marines participated in the first major ground action of the war as they repulsed a large Iraqi mechanized force.

Prior to the actual invasion of Kuwait by Iraq, there had been almost a decade of anticipation and planning by U.S. military planners for a deployment to the Gulf. In fact, the Marine Corps had anticipated a potential deployment to the Gulf "ever since the day the Rapid Deployment Force was created to be sent to Iran in case the Soviets attacked through the Zagros Mountains to seize a warm water port on the Persian Gulf."[29] Despite this advanced preparation, Marine Corps planners had a massive task in deploying historically large numbers of men and materiel to implement pre-deployment armor plans.

C. The Air War

As the Gulf War got underway, there was no doubt that the KTO would be dominated by air power. The long awaited Desert Storm began on 18 January at 0300 hours, when coalition forces aircraft struck designated targets in Baghdad, massive missile attacks were being launched in the heart of Iraq and Kuwait by other allied forces. Both the length and the unrelenting nature of the air war defined the nature and the tempo of the total assault scenario, and bought precious preparation time for the expected ground offensive.[30]

In a combat environment virtually unchallenged by hostile forces, the effects of the six week air campaign resulted in the unparalleled destruction of thousands of enemy tanks, armored personnel carriers, and artillery pieces. The origin of the doctrine responsible for this mass destruction was a decade old form of warfare which integrated air, land, and sea campaigns into a synergistic amalgam which had been developed for meeting a Soviet threat in Europe.[31]

The integrated air concept had been principally shaped by Air Force Colonel John A. Warden III in his book, *The Air Campaign: Planning for Combat*, published by the National Defense University in 1988. The air campaign in the KTO was based on Colonel Warden's theory that every wartime enemy has a *center of gravity*, the place where an attack would be decisive. The most important dividend of this concept is that air power may defeat the threat force without resorting to using ground troops, or would inflict such significant damage to the enemy that ground troops would only be utilized in *mopping up* operations.[32]

During the six week campaign, U.S. military planners watched their aggressive air campaign achieve definite superiority over the Iraqis. The mission objectives for the air campaign was to (1) destroy/ neutralize air defense command control; (2) destroy nuclear, biological, and chemical storage and production capability; (3) render ineffective national and military command, control, and communications infrastructure; (4) destroy key electrical grids and oil storage facilities; (5) eliminate long-term offensive capability; and (6) disrupt and weaken Republican Guardforces. By accomplishing these objectives, allied planners expected that they could buy precious time to prepare for the ground campaign.[33]

Many defense analysts believe that the vigorousness of the first air war conducted on a 24-hour basis so immobilized the Iraqis that they experienced an immediate and dramatic decline in effectiveness. Clearly, the Gulf War was a bold reminder of the axiom that air combat is inalterably linked to the ground war.

IV. THE KUWAIT THEATER OF OPERATIONS TACTICAL ENVIRONMENT

A. General

Probably no previous military engagement in military history could boast of such obvious tactical advantages for allied forces as was present in Southwest Asia. First, Iraq possessed no physical barriers with which to repel a land or sea invasion; secondly, Iraq's terrain lent itself to easy surveillance from the air or ground by potential assault forces; and finally, during the prepositioning period and the offensive operations, the United States could avail itself of the excellent logistic bases sited in a proximate and cooperative host country.

But, while both the terrain and the environment in the KTO provided the Marine Corps with significant tactical advantages, it also contained numerous difficulties and hazards which were capable of impairing the Marine Corps' ability to operate effectively, and which in some instances, delayed allied offensives.

1. Environmental Aspects

The area of operations in which I MEF operated during Operation Desert Storm was the southern segment of the KTO, which included northern Saudi Arabia and south-central Kuwait. The desert environment in the KTO is virtually featureless, has limited vegetation, and is characterized by sprawling, comparatively flat plains with little to break the terrain.[34]

Although the open plains of the KTO desert environment in the KTO may be considered conducive to battlefield mobility, the region is also noted for its comparative hostility to humans. The Saudi desert area sits beneath a belt of descending, drying air that deters plant growth and prevents adequate rainfall. Consequently, with a minimum of cloud cover in the region, the land mass heats rapidly during the day, and experiences rapid nighttime temperature drops.[35]

The KTO desert offered a wide variety of weather conditions which had the potential to impede an infantry Marine's progress--from highly arid conditions with blowing sandstorms to marsh-like conditions with soaring levels of humidity. Thus, it became imperative that each Marine become a keen observer of the weather and terrain of the desert in which he had come to live and to fight. [36]

2. Tactical Significance

a. *Terrain and Weather.* While modern technology has greatly affected modern warfare, a region's unique climate, terrain, and topography continues to dictate the complexity and tempo of a campaign while driving the tactical performance of a military force throughout the battlefield.

In the KTO, Marines learned that the sandy or dune deserts, which are great land masses covered with sand or gravel, can combine with excessive winds to create a light dust which threatens the sensitive tactical equipment of a modern mechanized force. Marines in the KTO also found that excessive winds create hillocks, which can be deceiving and quite treacherous to move across in a vehicle. Other natural hazards to combatants in the KTO included cacti or other thorny bushes, desert rock and boulder-strewn areas, and virtually impassable salt marshes.[37]
The desert climate, with its potential for sudden change, concerned senior Marine planners, and in some

instances actually impeded offensive movement. Perhaps the heaviest Marine Division ever to take the field (over 20,000 Marines) was delayed when, during the first week in February, I MEF approved a plan in which the 1st Marine Division would conduct a breaching operation, with the 2d Division passing through the 1st Division lines as an exploitation force. Lieutenant General William Keys, CG of the 2d Division, delayed the assault after General Schwarzkopf expressed concern about the deteriorating weather. Keys said, "We delayed the assault for two days, waiting for better weather. The weather just got worse. So, we put our heads down and kicked off the assault on 24 February, even though the weather was still rotten." [38]

Clearly, the weather during the campaign was a deterrent; in fact, some analysts claimed the region was experiencing the worst weather conditions in several years. From the first extraordinary storms in the first two weeks in January, to the gritty sandstorms of the final Marine offensive in February, weather inhibited U.S. troop mobility, and its ability to assess damage to strategic targets.[39]

In the KTO, the terrain, however, became a real combat multiplier for Marine Corps armor. With its unbroken terrain, the ability to see Line of Sight (LOS) was commonly in excess of five kilometers. Gently rolling *slopes*, however, routinely provided militarily significant reverse slope possibilities of 300-800 meters. The open terrain was found to hold a number of dangers for the Marines on the ground, according to General Keys, "Just like on the beach, you had absolutely no cover. You had to depend on speed to get through the Iraqi minefields before an enemy artillerymen opened up with a barrage of steel rain." [40]

Another immediate concern for the Marines in SWA was that their numerous weaponry systems had been designed for and intended to be used in a Central Front in Europe. These systems had to be quickly modified for a desert environment. Many Observers have noted that these modifications were successful due to the innovative spirit of Marines, and their attention to an intensive preventative maintenance program. Another concern was the newly developed and highly technical battle management systems, untested under battle conditions. Thus, the desert environment in SWA possessed great tactical significance for Marines, and many lessons were learned about the tactical environment in a desert war.

Because of the years of experience training in the desert environment of Twenty-Nine Palms, Marine tankers who deployed to SWA were not generally surprised when they confronted the Saudi desert. Yet, a number of new conditions were confronted. From the outset of the conflict on 16 January, visibility was limited because of frequent rain, heavy clouds, high humidity, morning fog, and day-time haze and dust. Virtually every post-Desert Storm battle assessment report emphasized the unique visibility problems in the Gulf. Saddam Hussein added to the naturally poor visibility when he blew up oil wells in Kuwait. Reporter Colin Nickerson of the Boston globe commented on the result, "In the hours before the attack, heavy smoke from burning Kuwaiti oilfields formed a threatening black curtain on the horizon. The smoke blotted out the sun and spread noxious fumes over much of the battlefield." [41] Fortunately, for those Marines who fought in an M1A1, or who employed a dragon or TOW weapon system, little concern was registered, because they were equipped with the latest design in thermal sights.

Major General J. M. Myatt, CG, 1st Marine Division, noted that a providential wind change and a little luck helped Marines during the pre-invasion period. For six months, his forces had observed that the

winds had always come out of the northwest. Then, according to General Myatt, "When we began the campaign in our area, the wind, for four straight days, was out of the southeast, so it pushed the smoke from the burning wellheads in the Iraqis' faces; they simply could not see us."[42]

For six months, natural atmospheric conditions in the desert created hazardous fighting conditions for Marines. Then, as the ground assault was imminent, General Keys, Commanding General, 2d Marine Division saw, "A shift in winds began to disperse the smoke, and by morning rainclouds and fog had turned it into a single band of slate-gray haze."[43]

Another natural desert phenomenon which created distinctive visibility problems in weaponry employment for Marines were the terrific shimmering heatwaves. Desert tactical observers have claimed that they can, "Easily disrupt accurate sighting at ranges surpassing 1,000 meters...with the effect becoming even more intense when observation is made through sensitive optical equipment."[44]

One phenomenon which potentially could have inhibited the freedom of movement of armored vehicles was the terrain phenomenon known as *sabkhas*, or moist tidal flats that extend inland from the coast to a maximum of approximately seven kilometers. Sabkhas are located principally in the far northern coastal region of Saudia Arabia and in the southern extremes of Kuwait. This phenomenon is highly restrictive to any vehicle movement particularly during the wet winter months. While the sabkhas were a tactical factor during the defensive stages of Desert Shield, they did not affect Marines during Desert Storm who had moved inland and away from that area.[45]

3. Marine Armor Tactical Considerations

There were many tactical lessons learned by the Marines in the KTO. First Lieutenant Chris Fraitis, Executive Officer of "C" Company, 3d Tank Battalion recalled that a valuable lesson was learned about placement of tanks on the battlefield. Fraitis recalled, "We pushed a platoon up, and I brought the rest of the company up. And as the infantry was coming through--a couple of bunkers they were clearing--they all dropped to the deck, threw a couple of hand grenades into the bunkers. That's when we found those positions weren't unoccupied. The lesson I learned from that was--they wanted to put the tanks someplace (an orchard that had not been cleared by infantry) they weren't designed to go. And had somebody really been in that position--we were stopped, we were in the open--they could have volleyfired on us. They could have wiped the company out."[46]

Marines also learned that the fog of war could create mass confusion on the battlefield, and that a demonstration of initiative could save their lives. According to LT. Fraitis, "We pulled up to some high power lines and sat there. I was second from the right vehicle, and I started hearing arty coming in through the haze. Visibility was still real bad. I told the skipper that there was arty working its way toward us. You could finally see it; that an FO was walking it. The skipper tried to get permission to move, but nobody O.K.'d it, so on his own initiative he moved us... After we moved maybe 1,000 meters, I looked back and somebody called a fire-for-effect right where we'd been sitting. That whole area got wiped out. If the skipper hadn't moved us, we would have been in a shit sandwich."[47]

V. OVERVIEW: MARINE CORPS ARMOR IN DESERT STORM

A. General

Although allied armored forces were not truly tested by Iraqi forces, Operation Desert Storm again clearly demonstrated the devastating impact of armor in the classical sense on the modern battlefield.

To fully understand allied armor's impact in SWA, one only has to examine the number of catastrophic kills of enemy forces by Marine armored units. Those successes were characterized by the swiftness with which Marine armor breached Iraqi heavily fortified positions while sustaining few friendly casualties. This was due, in part, to the excellent Marine Corps table of equipment, which included the M1A1 and M60 Tanks, with their impressive array of advanced technology, and the Marine Corps imposing anti-tank systems, represented by the TOW, Dragon, and LAW.

At the outset of Desert Shield and Desert Storm, the Marine Corps had only a moderate size tank structure. In February, 1990, the Marine Corps Gazette reported the following Table of Equipment:

1st Tank Battalion (4 companies) at Camp Pendleton;
2d Tank Battalion (4 companies) at Camp Lejeune;
3d Tank Battalion (3 companies) at Twentynine Palms;
1st Armored Assault Battalion (2 companies) in Okinawa.[48]

B. USMC Armor/Anti-Armor Equipment

1. The M-1A1 Tank.

In a highly exposed fighting environment, such as that found in Kuwait and Saudia Arabia, the M1A1 proved to be an effective weapon. Its speed (up to 40 m.p.h.), thermal sights, long-range gun, and depleted uranium armor designed to withstand direct hits, gave the Marines who manned them a greater feeling of confidence and security with which to engage the enemy. A Lieutenant of 2d Tanks said the M1A1, "Has done a tremendous amount in terms of the morale and the esprit of the crew. This battalion has such a high level of excitement over this tank and what it can do, and probably more than anything else, is the fact that it was a survivable vehicle over the M60."[49]

Despite the rapid mobilization and deployment of the Marines, even the limited time allotted to retrain on the M1A1 did not diminish the praise for the Abrams. But, one Marine maintained that, "It was something that had to be done, and we did it (trained) within the time constraints. We were fortunate that we had a month to work with the tank after we finished MEC, before we got into the fight...but,... the 14 day MEC cycle is absolutely insupportable unless it is followed up by a unit training package that includes more gunnery training."[50]

One factor which concerned many military analysts was the question of fuel consumption on the M1A1. On 26 September, 1990, ABC-TV's Peter Jennings raised, "Questions about the M-1's usefulness" on his prime time newscast, and ABC Pentagon correspondent Bob Zelnick worried that, "Because of its weight and gas turbine engine, the [M-1] tank uses between two and five gallons of fuel per mile." To counter these assaults on the M-1, General John W. Foss, Commanding General of the Army's Training and Doctrine Command, said, "I don't see the fuel consumption issue as a major problem, and anybody who has dealt with it doesn't see it as a major problem. It's only those who don't understand [refueling tactics] who would make it a major issue."[51]

Colonel John S. Caldwell, Jr., who helped test the M-1 cited the impressive test record of the M-1, "I believe the *numbers* [over 700,000 hours of tests in a desert environment] show the M-1 is the most reliable tank soldiers have ever had..."[52]

Captain Jim Flowers, of the 2d Tanks agreed that the Marines had no problems with fuel consumption, "Fuel did not become a problem. We'd been monitoring (our fuel use) every time we moved, we would monitor our fuel rates, based on the type of operation [e.g. cross- country movements], and our low fuel consumption was 4.2, and our high was 8, when we were moving all the time."

Flowers added that constant surveillance of fuel levels paid off, and recalled that he did not experience any serious problems with fuel consumption, "We never had a fuel problem...we were carrying on board about twenty thousand gallons, and that will give you half a tank of gas for every tank in the battalion, and we never allowed ourselves to go below half a tank. We brought the fuelers forward at the thirty mile point...service station style...gassed them up and we were on our way. It worked very efficiently."[53]

Captain Flowers lauded the use of the T-49s and their usefulness in refueling, "I think they are a tremendous asset...better than the LDLS, because they can get around in tight spots. I would not like to see us lose them...in fact, if you're going to replace them, have the capacity to put pods and pumps on the back of a 5-ton for those types of units."[54]

2. The M-60 Tank

The M60 had its share of proponents among the Marines who fought in SWA. One Marine gave the following testimonial to the M60, which some Marines considered the most reliable of their armored vehicles, "A lot of the major magazines -- Time, Newsweek -- they're saying the M1 did this-well, that's media for you--Well, see, they have to sell it -- we understand that. But us being M60A1 tankers for the Marines Corps would like to see a little footnote that the M60A1 did its job. They were a good piece of gear. And surprisingly, for coming off a ship -- being on there for so long -- they held up great."[55]

3. TOW Weapons Systems

By all accounts, the Tube Launched, Optically Tracked, Wire-Guided (TOW) weaponry system employed by the Marine Corps in the Gulf War may be considered an unqualified success, primarily due to its range, the speed of its carriers, such as the High Mobility, Multi-Wheeled Vehicle (HMMWV) and the Light Armored Vehicle-Anti-Tank (LAV-AT), and their thermal capability.

In virtually every after-action interview, Marine LAI and HMMWV TOW gunners and crews expressed great confidence in the advanced technological systems with which their units were equipped. The thermal sights served not only as a weapon sight, but also performed as another set of eyes for the crews by penetrating the darkness and haze of the vast battlefield, which had been further darkened by oil smoke created by the burning of oil wells by the Iraqis.

Marines also found that the thermal sights were an efficient manner of target acquisition of dug-in Iraqi tanks and other armored vehicles at extended ranges of approximately 2500 meters. Even though the thermal sight is audible at distances up to 200 meters at night, it also functioned as an effective forward

local security for crew members. Both gunners and crews were unanimous in their assertion that they considered thermal capability an essential requirement for night operations.

Marine TOW gunners cited the effectiveness of the TOW missile's performance and reliability, but found models older than the TOW-2A less reliable. TOW units also noted the missiles seemed sensitive to heat and did not appear to take well the stresses placed upon the missile as a result of continually moving cross-country. These concerns suggest greater study of the peculiar characteristics of the KTO environment. and its affects on our weapons systems.

The range of TOW engagements varied from 65 meters to the outer limits of the systems range of 3,750 meters.

Some Marines who manned the TOW systems expressed concern about the nature of the TOW school training, and how effectively the school prepares Marines for the Fleet. According to SGT O'Neil, TOW Company, 3d Tanks, "They just learn the very basics there. First off, when a Marine comes out of school, he's going to be an A-gunner, which is (also) a driver. He doesn't know too much about the vehicle. From what I understand about the school they really don't drive the vehicles much. I've had people out that have driven the vehicles once or never. And that means also that they've never hooked up the system using the vehicle power. So if they're coming over from SOI into something like this, you've really got to train them fast."[56]

One of the primary areas of concern was that most of the TOW work was done on the ground mount; in fact, most young Marines indicated that they couldn't recall receiving instruction on how to mount the weapon on a vehicle, and in tracking and doing gun drills off the vehicle. Additionally, they believed that students should emerge from the TOW school knowing how to drive and how to manipulate the TOW on top of a vehicle. "Especially for driving a vehicle, -- it's not like driving a car. You have to learn how to hide the vehicle. What they should also do...is teach the clock method. When I say 'Go left', left is one thing to me and another to the driver. If I say 'Go twelve o'clock', 'Go ten o'clock', he knows what I mean."[57]

Many of these same Marines believe that many contemporary methods being taught in TOW schools need to be reexamined to properly train for combat, "First of all, I'd cut all extraneous training. I'd just tell the Marines...'This is how much the thing weighs; this is what it is.' Then they would know how to work it, how to do the self-test on it, and, one of the big things--how to troubleshoot the system when something goes wrong. Second, the day sight is a good piece of gear, but it is basically for acquiring the target. Also, I'd train mainly on the night sight, because that's what you're going to want to use in combat; that's what we all fired with. I'd give the Marines more driving time in the Humvees, get to know the Humvees, mount the systems, and do gun drills on them."[58]

SGT Martinez, 2nd Section, TOW Platoon, 3rd Tanks, who has spent eight years as TOW squad and section leader, with two infantry regiments and two tank battalions also expressed great concerns about the preparedness of younger Marines emerging from TOW schools. According to SGT Martinez, when they complete their training, "They know the TOW system, they know the capabilities, but that's about it. As far as driving time, tactics, communication skills -- it's about 5%, and they don't come with licenses to drive the Humvee TOW variant."

When asked if newly trained Marines are prepared tactically, e.g., do they know how to employ the TOW, how a TOW fits into a section, or how a section fits into the overall scheme of battle, SGT

Martinez replied, "None of them know anything about TOWs except how to assemble and disassemble the TOW system. They don't know anything about defensive positions or going into the offensive."

The critical aspect of communications training was also noted by SGT Martinez, who recalled that many Marines did not know how to use the radio for communication purposes, even though he felt the TOW system definitely relies on comm, "Not one of them knew how to put it (the radio) together, and a TOW system does rely on comm...basically a tank battalion usually puts you out front because of your optical capabilities. And they want SitReps or SpotReps brought into the battalion commander, which most of them (the new TOW gunners) didn't know how to do."

SGT Martinez believes that a minimally trained TOW gunner should have specific minimal skills when he arrives in the Fleet, and with those skills, be prepared to continue his education. Those basic skills, according to SGT Martinez are, "One is comm -- it's very essential to a TOW platoon. The second skill would be driving techniques, especially in the desert. A third, and very important skill. is tank identification. And, of course, good gunner skills."

Because TOW units fit into a larger tactical scheme, and a much faster tactical scheme, the knowledge of tactics become important for all members of the TOW unit. SGT Martinez said that many Marines were not trained fully in tactical considerations, "Every tank battalion has their own tactics- the COs always put in their SOPs. But the basic formations are one of them -- the wedge, the herringbone, the staggered columns -- that's what I expected (the new 0352s) to know at first. But not one knew what a column was, a staggered column, a 360 coil, or even a herringbone. Major Terrell, TOW Company Commander of the lst Tank Battalion believes that serious tactical errors were made in using TOWs by squads instead of by sections or platoons, "Everybody else wanted to split them up, and would use them by squad. (Note: A TOW squad includes two systems, a section includes eight.) It was pretty frustrating. In fact, I knew of at least one case where tanks got away because they employed them by squad, instead of by sections or platoon.

The day before the ground war started I had my Third Platoon assigned to Task Force Taro, and they were up on the berm, maneuvering around. Two Scorpions (armored reconnaissance vehicles) came down at them, and because they had split them up, literally, by squad, there was only one squad that was in position to engage them. The first TOW vehicle engaged and hit a tank, but didn't kill it. The second vehicle had a hang fire, and couldn't get its missile cleared. The first vehicle reengaged and killed the tank it had immobilized the first time, but in the meantime, the other Scorpion, which were acting as scouts--for artillery, probably --turned around and left, and got out of range. We could have killed both of those, and saved them getting fired at by artillery, perhaps, if we'd been able to volley fire with a section. And that was a problem throughout. We had a hard time convincing the infantry not to employ them by squads, that these aren't rifle squads, that the way to engage armor is with massed fires. And for some reason or other the infantry seems to think two TOW systems is massed fires, when in reality eight, at a minimum, is needed."[59]

Major Terrell also recalled that the TOW unit was forced to devise some innovations in communications, " My XO acted as a FAC and called a lot of air. We gave him a hardback vehicle... and mounted a MULE on it. He had six different radios on it... He had all the radios you need for a FAC, plus he also had the FO with him, so he had the conduct of fire net, plus the company net and the battalion net... So he had quite the radio suit in the vehicle -- antennas hanging all over it. But we mounted them, and we never had any problem with interference -- it worked pretty well.

If you're going to use TOW Company as a maneuver element, which this battalion did, they need to develop this capability in a more permanent manner."[60] Major Terrell continued, "Mostly what we used were TOW Cobras, which were very effective, and he (the Company XO/FAC) was very effective at getting them in -- they helped us a lot.

The other advantage of having him on the radio was we were able to talk to the OV-10s. At one point...we were the farthest out east element...and when the sun came up, in the fog, we couldn't see very well. And when the tanks started coming at us, our first warning was from the OV-10s. That allowed us to shift from one flank to the other...They discovered there were twenty tanks coming at us from what would have been our left flank --from the north -- and itallowed me to shift a platoon over, and we were able to, one, kill all those tanks, but two, control the battle that way. It was an advantage to have the FAC with us."[61]

The desert war called for quick decisions by tankers, and their experiences in the desert seemed to suggest some natural modifications to vehicles which would make them more effective. According to MAJ Terrell, "We found that we were often used on the flanks of battalions and the fronts of battalions, both with the infantry and with tank battalions. In this type of war, that meant we were often in direct contact with the enemy's infantry. And we felt very vulnerable at times because we did not have machine guns.

The Army has a variant...of the TOW vehicle that has double pintle--on the back, almost 189 degrees out--that can swivel around as you move the turret around, that they mount an M-60 machine gun on.

Several times, specifically with units that were with the infantry, they (the TOWs) were being fired at by small arms fire while they were engaging tanks much deeper, and they only had the one Mk-19 per section to suppress. And they were very sensitive about that -- sometimes more concerned about that than killing the tank 3,000 meters out.

Obviously, I would be more concerned about a guy shooting me with a rifle when you know you're in a Humvee that rifle's going to go right through. If we'd have had that ability on all of our vehicles, one vehicle...could be engaging the tank while the other vehicle was suppressing the infantry. One, it's a modification that's already available. Two, it's relatively inexpensive other than getting machine guns... I think it would greatly enhance the ability of the TOWs...to screen effectively and not have to worry about enemy infantry."[62]

GySgt. B. Saucik, Tow Company Platoon Commander, 3rd Tank Bn expressed reservations about attaching a TOW unit to an infantry unit, "It seems like overkill or a waste of assets attaching a TOW platoon to a rifle company. I disagree. I've seen TOW squads attached to an infantry platoon. And that's really *underkill*."

4. Light Armored Infantry Vehicles

The Light Armored Infantry (LAI) organizes itself into a task organized fashion for each specific mission. The unit is essentially a mechanized reconnaissance unit, but its vehicles are not heavily armored enough to be used as assault vehicles. LAI vehicles are fast, have very light armor protection, and adequate fire power.

According to Captain Peter Gutensohn, the LAI has an impressive array of weapons systems, "It has a fairly heavy punch. There is a 25 mm gun on each vehicle, two machine guns per vehicle, and the TOW vehicles have two tubes ready to fire at all times. We have an 81 mm mortar variant that travels with us at all times."

Despite this firepower, Gutensohn is cognizant of the limitations of the LAI, "We have very little ability to engage and sustain an offensive or defensive operation. Considering the terrain, what we wanted to be able to do is take as much frontage as we possibly could and keep our eyes forward and fight a counter-reconnaissance with the Iraqi mechanized reconnaissance forces."[64]

Through this strategy, the LAI prevents enemy LAI reconnaissance vehicles from moving forward to probe the depth and strength of friendly forces.

Some Marines suggested that in the event of casualties, the LAV could be used for protected transport, "The need exists to have an armored ambulance of some type with each company. The first thing that popped in my head was an LAV. In an armored-type unit, you're either going to get catastrophic casualties, or minor ones. The minor ones, you could probably fit in an LAV -- it's quick, it's got mobility, it's armored, and it can shoot back."[65]

Major Holbert expressed concern regarding medevac arrangements/equipment, "The distances were too great. We don't have dedicated armored ambulances...so you're talking about going through a breach of soft-skinned vehicles. In our battalion we took some of our chase vehicles, our amtracs, and made them into armored ambulances. Our 88s -- our recovery vehicles -- were dedicated, during the breach, as armored ambulances. So we made do with what we had, but we need to get air further forward, and I think it would have been a problem getting air."[66]

5. The Mine Plow

As members of the 1st Platoon, 8th Tank Battalion stated, "We can destroy in zone, but we can't clear in zone."[68] Unfortunately, during the Gulf War, many armored units found that the mine plows, so important in breaching operations, were extremely slow, "The going got a little too slow. Off to the right side of the road there was a double row of concertina. We used the mine plow; punched a hole through it. Which wasn't really a good idea. The lesson learned there is the wire sticks to the mine plow and wraps itself back into the track. We were told by the engineers when we got the plows that you could punch through wire. Can't do it... the tank that punched the hole took a half hour to cut the wire out. This is all without knowing what was in front of us."[69]

6. Night Sights

One of the most common complaints from armored units in the KTO was the noise made by night sights, "The night sight needs to be quieter. At night, when we were dug in to our positions, the infantry relied on us for our optics, because they couldn't see anything with their passive sights. Passive sights won't penetrate through fog. Thermal relies on heat, so fog has no effect on it... In fact, there was a couple nights it was so thick out, that when the night sight was whirring, that's how we would locate from one vehicle to the next. We could really hear that about fifty meters in the dead of night.[70]

In addition to the requirement that the night sight be less noisy, Corporal Theemy also found that they needed to be more powerful, "The night sight needs to be more powerful. You can identify a heat source and probably tell what it is at three thousand meters. You can see it's a tank, but not what type of tank. A LAV looks like a BRDM. A Challenger looks like an M1A1. There's just a lot of tanks whose silhouettes are very similar, used by a variety of countries. So you can't make positive target I.D.s. That could be fatal for the wrong person.[71]

According to Major John Kelly, who headed the Armor/Anti-armor Battle Assessment Team, Corporal Theemy suggested one of the most original and innovative field expedient products, "Somewhere down the line you could also use an internal compass on the op sight (the TOW optical sight) because a lot of the time that piece of equipment is used for calling in artillery or air strikes."[72]

Captain Robinson, Commanding Officer of B Company, lst Tank Battalion noted serious problems with the TOW night sights, particularly when the thermal sight was mounted on the vehicle, "We did have difficulty with the (TOW) night sights... When the thermal sight was mounted on the vehicle all the time, we had trouble with them going down. There's a natural attrition that's going to take place for the amount of use that the night sights initially received in the defensive mode -- they were on continuously for observation."

Captain Robinson also recalled that the extensive use of the night sights had the potential for major maintenance problems, "And then there was a timeframe when we were doing thetransition from defensive to offensive ops...we were able to stand them down. As we prepared for offensive ops, we used the thermal sight very sparingly, because we were coming to a (situation) that, due to use, they were dropping off line. At any one time, we would have four night sights down. The problem with that is that there was such a backlog at ElMaCo -- the only place to get those systems fixed -- that once you floated them, they were pretty well gone."

Sgt. O'Neil, TOW Co., 3d Tank Battalion noted the visibility problems with day optical sights, "Since we never train with it (the day optical sight) -- the lens we've got on there for protection against lasers -- it makes everything a lot darker. It was bad conditions as it was; it was dark from the oil in the air. It was almost impossible to shoot a missile through the day sight (with the anti-laser cap installed).

Of five tanks we were issued one pair of binoculars... There are two pair (of NVGs) in the platoon. (NOTE: On a tank SL-3, Marines usually rate two Night Vision Goggles (NVGs), and one pair of binoculars per tank, "We train like that. Back at the reserve center we had two sets for each tank. You can't spot -- if you see a little bleep off at 3,000 meters -- my eyes were glued to those binos. And at night...the 36 sight is not a good night sight...it's too old - all you see out there is fuzz.

We were given a very hasty frag order that a column of T-72s were spotted... on the road coming towards us, and we were scrambled. We set up a defensive position two klicks out from the infantry . And it was dusk, and as night came in, all I was thinking was 'Oh shit, T-72s - they've got thermals, they've got lasers, and here I'm trying to see something through the goddamn M36, and I ain't seeing it.' The night vision goggles -- fortunately I had a set -- but the other four tanks didn't..."

7. Vehicle Identification

Major John Hemleben, S3, lst Tank Battalion recalled that in the desert, with varying visual conditions, vehicle recognition was a real problem, "Again, limited visibility had something to do with it. One of our complaints -- and this is something we're going to rectify when we get back to Pendleton -- is thermal sight imagery of enemy vehicles. We didn't have that available to us. I'm not sure that we really pursued that -- maybe we could have done a little better job -- but no one really thought of that. What does the target look like? What does the bad guy really look like in the TOW sight?... That would really have helped our TOW gunners. And I guess no one really thought of that."

An unidentified Gunnery Sergeant from the lst Tank Battalion agreed that more attention should be given to vehicle identification, "We need to concentrate on vehicle identification, and aircraft ID. They didn't have any air up, and we're luck for that. Not only do we need to concentrate on vehicles as a whole, like Warsaw Pact vehicles, but on specific countries, like Iraq. What does Iraq have? What Mods do they have? What are their capabilities? Pick out specific countries like North Korea. What do they have? And when I get back that is what I'm going to start concentrating on."

First Lieutenant Chris Fraitis, Executive Officer of C Company, 3d Tank Battalion, recalled an incident when night combat conditions exacerbated the concern about becoming a victim of friendly fire, "The move up to the breach site was conducted at night. We were worried about the possibility of friendly air running on us, so at the last minute we had IR (infra-red) strobelights put on three of the tanks in the company. We made the move by NVGs. The IR strobes weren't properly shielded, and they lit everything up -- the whole countryside. So if anybody had been sitting up at the first breach site, if they had NVGs, they would have seen us coming. Lit the whole sky right up."

Captain Schwarzkopf, Commanding Officer of A Company, lst Battalion, also experienced a stereotypical fog of war incident which clearly pointed to the concern for more efficient identification devices, " Later on in the second day we were supposed to have (an infantry battalion) fifteen klicks in front of us, in our zone. They were actually ten klicks behind us, out of our zone... Because of that we couldn't shoot up targets until we had positive I.D., since they were supposed to be out in front of us. A couple hours, several hours later, they caught up with us and the only reason they didn't torch the whole company was they had amtracs leading and their (tanks) following. Their amtracs shot up the battalion and their (tanks) were about to torch off some rounds when the 3 got hold of them and shut down their fire.

They were leading with amtracs in open ground, tanks following. We were lucky because if they had done it the other way around... the (tanks) were just about to shoot when the 3 got a hold of them. The amtracs had done a good job of shooting up the combat trains, the tail-end company... They were behind us, and the (tanks) were coming toward us, and they were about two thousand, twenty-five hundred, when they all of a sudden veered off back into their zone."

8. Applique Considerations

An unidentified tank crewman from C Company, 8th Tank Battalion recalled that under battle conditions, he could not see the logic of applying applique armor to his vehicle, "I couldn't see any reason for putting the fake (applique armor) on. We were told, 'Hell, the Iraqis can't tell the difference between it.'... If some idiot wants to pop up with a RPG you can't say, 'Don't shoot at this side - let me face you, where the real shit's at.'

It was a very unnerving feeling to be going into a hot fire zone knowing that some little asshole can pop up at any second with a RPG and just wreck your day because you've got fake stuff on the sides -- which, that's where he's going to shoot -- he's not going to shoot from the front.

9. Weapon Firing Consideratons

Captain Dennis Greene, A Co., 2d LAI Bn, noted his concern with the 81s, "I was pretty convinced with (only) two 81 tubes, I'm not going to suppress anybody -- I'm not going to suppress tanks. By the time you get rounds on target they're going to be gone. With 81s, tanks aren't going to be excited about that. So we focused our efforts on marking for air; maybe some immediate suppression-type stuff for infantry -- machine gun positions, a threat .50 cal or something out there... And he marked -- the day of the 23rd -- he probably ran five or six missions marking for air. He did a real good job.

The only problem with the 81 is, due to its limited range...if the enemy's not real close to you, you either got to bring your mortar right up to your lead platoon...or he'd have to move forward. So sometimes we had a hard time marking for air."

Members of the lst Platoon, A Company, 8th Tanks recalled a another firing incident which proves that in combat, unusual conditions sometimes requires unorthodox solutions, "We came upon what appeared to be this low silhouette -- top of a turret of a tank. So my loader confirmed it, my gunner confirmed it, and we shot, and we destroyed that target. When we went up a little ways more, the same thing happened.

It was right in front of (the Gunny)... At that point I had noticed no one shooting or had destroyed this target at all. Again, my loader confirmed it, my gunner confirmed it, and we tried to fire, and my gun was out of battery. What happened -- the prior shot that we took -- the gun didn't recoil all the way and left about an inch and a half gap in the breech itself. So -- it was kind of ironic, because at the same time, I lost comm -- the only thing that I thought to do was I got over as close as I could to Red Four, and *yelled at the top of my lungs that there was a target.* Marked it with my .50 cal, and the target was destroyed."

10. Intelligence Considerations

Major Hemlieben, S3, lst Tank Battalion described the problems which resulted in the general perception that there was a breakdown in KTO intelligence, "We had Bravo Company, who was attached to (an infantry company). They were the breach element for the task force. They received their intelligence and information only about 72 hours before they crossed the line of departure. I don't think that was really acceptable. The obstacles didn't change that much.

There was also an entire mechanized brigade that counterattacked us the next day. We did not get <u>any</u> reports on that. And I find that extremely disconcerting when I figure the consequences could have been pretty disastrous. They hit us eight in the morning, the fog was thicker than pea soup -- average visibility was between 50 to, as the fog thinned, 500 meters -- and it could have been hairy. They actually got into our position with some mechanized vehicles and a few tanks."

Major Hemlieben noted the invaluable intelligence that was gained from the OV-10, "We did, however, get some intelligence generated from OV-10 support, and that came to us directly through our air officer, and that was invaluable. We got nothing from higher agencies. I'm not sure what the recon and

surveillance plan was north of the breach; we were never privy to it at the battalion level. (Note: The narrator's unit was the lead unit in several breaches.) So most of the intelligence, once we crossed the second breach, we provided to higher headquarters.

Major Hemlieben also recalled the necessity of receiving intelligence about numbers and locations of hostile forces, "One of the things that really bothered me was, as we moved north and got the mission to assume positions south of Kuwait International, we were to guard the southeastern flank of the division and of the encirclement of the airport. The problem was the move we were to make was at night, and their were again, no enemy situation information flow down to the battalion level. We got nothing.

So when we went into this thing -- one, we went into it hurriedly. We were not allowed to send out our scout teams. We weren't allowed to do leader's recon. We weren't allowed to recon routes. And the maps we received had the various gathering centers, wellheads -- but they didn't have all the pipelines.

So when we made our routes it was purely on a map reconnaissance, a map study. And when we did that, we found as this thing unfolded on the ground, at night, with a smoke-covered sky, and then without nav aids, because the smoke didn't allow the GPS signal to go skyward and PLRS went out... So we had compass and odometers, no reconnaissance of routes, and then we had pipelines on the ground we didn't expect -- it was a zoo. And we didn't have any force dispositions. So...I tell you, we were lucky we didn't get our butts handed to us.

When we pulled in...we had to key up on a hard surface road and finally got into our positions in the middle of the night. We found out later in the morning that, on our... flank, there was a company of revetted T-55s. Had any of those crewman decided to fight, and pop a few caps into our zone, I'm afraid to tell you what might have happened. Probably intermural firefights, confusion -- it would have been very nasty. And a company of revetted tanks probably was known to somebody. I mean, Kuwait International had to have been a target of imagery.

We did get intel reports that Kuwaiti resistance told us there were no Iraqi soldiers in Kuwait City. How ludicrous is that kind of report?

We took about 35 EPWs the next morning, some of whom were tank crewmen. Which kind of scared the shit out of me. Because knowing that these guys were tank crewmen -- they probably came from the T-55s over on our...flank. So they had the capability of firing us up -- at least, really screwing us up.

C. MEF Training

When the Gulf War began, the Marine Corps was in the process of replacing its M60A1 tanks with the newer M1A1 Abrams. The New Equipment Training Team (NETT) program , a program to train Marines on the new main battletank, was just getting underway when the crisis in the Gulf region erupted. This proved to be timely, and a number of armored units underwent this training before embarkation.

When the majority of Marine armor units deployed to the Gulf, they were immediately assigned defensive positions along the Saudia Arabian-Kuwaiti border, and had little time for training. Then after it was clear that the air war had bought precious time before the beginning the ground offensive, there was opportunity for additional training for armored units.

During the preparation for the ground offensive, there was very little live-fire training. Tanks fired only to bore sight and Battle Sight Zero (BZO) their main guns, and AAVs typically fired less than 50 rounds. Little familiarization training took place with antiarmor rockets by potential users, which on the modern technological battlefield means each member of a military force.

Similarly, AAVs operating in SWA were equipped with Electric Drive Weapon Stations (EDWS), instead of the more contemporary Up-Gunned Weapon Stations (UGWS). Many AAV crewmen who had trained on the UGWS were faced with employing the EDWS in combat with minimum familiarization.

1st Lieutenant Chris Fraitis, Executive Officer of C Company, 3d Tank Battalion discussed the benefits of the *Sagger dance*, as an invaluable anti-atgm technique, "An explosion blew off the berm -- it was an ATGM. My driver told me he saw a launch too. So we whipped the tank around and started the Sagger Dance. I found the launch site, blew my smoke, and we continued to do the Sagger Dance until the ATGM blew up in the berm in front of us."

1. Communications

Members of the 1st Platoon, A Company of the 8th Tank Battalion remembered debates over whether it is better to have tank platoons on their own net, or to have the whole company on one net, "I thought it would never work. We talked to a couple people from 3rd Tanks; they said they liked it. We thought, 'Nah, it can't work.', but I'm convinced now that one net is the only way to go. For exactly the reason that I could hear what was going on all the way on the right and they could hear what we were doing, the platoon commanders could talk back and forth to each other, and this way when the CO and XO were doing fire coordination, calling in missions and air or talking to battalion, we could just continue to talk without having to switch back and forth."

2. Effective Fire Support

1st Lieutenant Fraitis, Executive Officer of C Company, 3d Tank Battalion described his Marine's imaginative modifications in order to increase the effectiveness of their fire support, "On the fire support side, we had a system we worked over here ourselves, which is of great pride to the air officer and the FACs. They came up with a system to put the MULE and the TOW thermal on a tank. And our comm techs, at the company level, worked out how to put a UHF radio inside the tanks.

So we basically came up with a whole FAC package...Everything was all self-contained, so if we did take arty, the only thing that would be damaged, instead of the days when the whole thing would be hanging outside, would be the antennas. We had another RT-246 inside, so he (the FAC) could talk on the TACP net without having to use the XO's RT."

Lieutenant Fraitis continued by describing where the FAC's MULE was mounted, "The reactive armor mods have a rail directly in front of the loader's hatch. One of the studs for the bolt -- the tripod the MULE comes on, they cut it down, and put a bolt on it, so we could screw it in right by the loader's hatch. They modified the MULE to put the TOW thermal (sight) right next to it, and the boresight

culminator for the TOW sight was modified by the TOW techs, so you could slave the MULE and the TOW sight, so they could be boresighted. So at night, if he looked through the thermal, he could lase and know he'd be right on target."

According to Lieutenant Fraitis, the system became so popular that it soon became standardized throughout the Battalion, "We had the first one, but everyone else picked up on it. It worked real well. We couldn't utilize it that well, because of the limited visibility. But I know the FAC that was with Delta Company had four kills using Hellfire.

And it was real responsive, because the Cobras -- that's the other lesson learned, having the Cobras as a maneuver element with the battalion, parked to the rear -- the FAC could get on the radio, 'I need you.', and they'd be right there. Whenever we came across a hard site or bunker, we'd have a Hellfire on it within two or three minutes."

Major Hemlieben, S-3 of the lst Tank Battalion discussed the prevailing concept of supporting arms that was used by his battalion, "The concept of supporting arms that we used... We heavied up on laser use... We weren't real keen on the reliance of smoke...We just didn't have any... The only Willy Peter rounds that we had in country came from the States, didn't come off MPS -- they had only two types of ammunition on MPS, that being HEAT and 833... We couldn't rely on arty, because a lot of times our schemes of maneuver called for going beyond arty range. So it was laser designations and limited Willy Pete for target marking, or it was, talk the air on target when you don't have any terrain features.

We had six lasers up, and they were invaluable. Hellfire was a devastating weapon. (Note: The Army reported one three hour long engagement during which Apaches launched 107 Hellfires; 102 hit targets) The Cobras could be working three kilometers behind you, you could lase four kilometers in front of you, they could launch Hellfire from back there, and destroy the target pinpoint -- with pinpoint accuracy... Optimally...between seven and eight thousand meters we were working. And that kept the Cobras out of harm's way.

D. Target Acquisition

The vast expanses of the KTO desert environment emphasized two fundamental combat problems as Marine armor engaged aggressor forces in SWA: target location and target identification.

It is clear that the effects of modern technology has clearly transformed the modern battlefield, with its innovations in precision guided weapons, advanced sensor and targeting systems, battle management platforms, and in stealthy delivery systems. However, an environment like the KTO still presents significant obstacles to location of infantry and artillery units, armored vehicles, and other concentrations of enemy forces.

The process of location, identification, and engagement of a target is ultimately the function of the individual gunner, and the desert environment with its limited visibility was an impediment to the accuracy of the human eye. Numerous reports from tank and other armored vehicle crewmembers cited their use of thermal sights, Forward Looking Infrared (FLIR), and radar imagery devices to seek out and destroy the enemy. Each of these systems proved to be a great advantage over the Iraqi forces.

Captain Altermatt, of the lst Platoon, C Company, 8th Tank Battalion, in considering the need to establish Battle Sight Zero (BZO) recalled the restrictions placed on armored units to shoot to establish

a zero (NOTE: Captain Altermatt's unit had six tank kills at between 1200 and 2500 meters, but previously had only been able to shoot at 500 meters to establish a zero, and had not been able to shoot at 1200 and 1600 meters to confirm the zero.), ...We drove two hundred miles in two days... All the manuals tell you when you do a long road march like that, you really should boresight the zero again... Once again we set up a panel at 500 meters. The logic was, I guess, they just didn't want us to shoot any farther than that. So we fired anywhere from four to, probably, seven rounds per tank, to reaffirm our zero at 500 meters. Once again, they wouldn't let us fire at twelve (hundred meters) and sixteen (hundred meters) to check that zero.

In my perspective, that was probably the one thing that we could have used more of. I can't believe with all the desert out here, we couldn't find someplace to put some rounds out. I know people who left here and went into combat without a good zero on their tanks...

Right after we crossed the first berm, one of the first things I did - there was a truck out there that I fired up for the sole purpose of checking my (zero).

I wasn't at all confident that it was going to be (on). And as a matter of fact it was off. We had to...shortly after we had the 'gas' attack and we hit the second berm, so there wasn't time to readjust the sights. We were aiming about three mils off and two mils low for the rest of the battles...

Well, as it turns out, we did real well. But if we had found ourselves in a Table VII or Table VIII position -- we're firing at tanks moving -- there really would have been problems. But, as it turned out, most of it was stationary. We pulled up and took a shot at another stationary target. If we'd miss, we'd adjust on to it.

I don't know what other people are telling you, but there were not, the majority of these kills were not first round kills... And there's no real reason for that, because generally they were stationary and we were stationary. If we'd have had a good boresight zero we could have picked them off a lot better, but that wasn't the case and we made do."

E. Ground Operations

When Saddam Hussein ignored President Bushs' deadline to remove Iraqi forces from Kuwait by , the world knew the time for the ground campaign had arrived. The Marine Corps, along with other coalition forces, was at a point of maximum readiness, and the long awaited, and much heralded ground war would begin on 24 February 1991.

The basic concept of operations for the attack had been in the making since the President ordered Central Command to develop an offensive option. The plan which was developed simply called for allied forces to "envelop and turn the flank of the Iraqi defenders while punching through the frontline defenses at several places simultaneously."[73]

Iraq strongly believed that the United States would mount an amphibious assault from the Persian Gulf, so General Norman Schwarzkopf, Commander-in-Chief, U.S. Central Command (CENTCOM), also included mass deception as a significant component of his overall Gulf War strategy, employing a 17,000 strong Marine amphibious assault force as the focus of that plan. The deployment of the Marines significantly lessened the threat to the coalition's ground invasion of Kuwait and Iraq by riveting Iraq's attention away from the combined Marine and Arab land forces tasked with penetrating

Iraqi defenses in three broad thrusts along the Saudi-Kuwaiti border. Elements of the 4th and the 5th Marine Expeditionary Brigades (MEB) actually feigned a full-fledged beach landing just after the ground invasion of Kuwait and Iraq began. That action actually kept the Iraqis in place, preparing for an amphibious assault which would never come.

The master plan also called for other coalition forces from *Joint Arab Forces-East* to begin moving along the coast road from Khafji, while the 1st and 2d Marine Divisions would travel northeast from the desert opposite Wafra. Syrian and Egyptian troops in *Joint Arab Forces-West* would then attack east of the Wadi al Batin and push toward Kuwait City. U.S. planners called for the U.S. Army's VII Corps to breach the line west of the wadi, speed past frontline divisions, and press north to turn the flank of the Republican Guard.

The final aspect of the plan was to employ the Army's XVII Corps in a rapid dash deep into Iraq up to the Euphrates River, drive east to Basra, and close off all routes to the north. The master plan would have the effect of containing Iraqi forces, who would either surrender or die. Later, these same Iraqi forces were enveloped by large allied ground forces pouring across the Kuwaiti border from Saudia Arabia.[74]

Although the start of the ground war was planned for 24 February with an armored attack into Kuwait, concern about getting through the formidable minefield, obstacles, and bunker complexes had prompted the First Marine Division to "infiltrate" two of its three regiments through the first belt of minefields beginning at 1900 on 23 February 1991. This was probably the action that Radio Baghdad was referring to when it announced on 23 February that the Americans had begun the ground war.

On the same day, one day prior to the actual kickoff of the ground war, the 2d Marine Division dispatched a screening force of Light Armored Infantry vehicles across the line and moved its artillery into position to support the main attack on the following morning.

The initial allied plan also called for the 2d Marine Division to function in a supporting role during the attack on Iraqi forces. The Army's VII Corps was to constitute the main attack, with a sweeping west and north movement into Iraq from Saudi Arabia. This plan for the Marines would be in the form of a three-prong attack. After clearing the Iraq minefield, the 2d Marine Division would split into three prongs to engage Iraqi forces; in the center, the 6th Marine Regiment would break through the minefield, clearing space for the Army's Tiger Brigade to enter the breach and deploy; on the left, the Tiger Brigade would go north, hook around Kuwait City to block the Iraqis; and lastly, the 8th Marine Regiment would push north to protect the flank of the 1st Marine Division.

DAY 1...G-DAY(24 FEBRUARY 1991)

The honor of spearheading the first coalition force offensive move after the beginning of the official ground campaign would go to the Marines, when, at 0400, the 1st Marine Division began its attack, easily breaking through the two great Iraqi obstacle belts. While reconnaissance had indicated that those extensive Iraqi fortifications included hundreds of mines, wire, a berm, and a ditch, the Marines successfully breached the line.[75]

Concurrent with the 1st Division's movement, the 2d Marine Division, accompanied by the 1st Brigade, 2d Armored Division (known as the "Tiger Brigade") crossed its own line of departure at 0530, and breached the Iraqi line with relative ease.

From his command post in the Central Command (CENTCOM) Coalition Integration and Coordination Center (CICC) in Riyadh, General Schwartzkopf managed the war while remaining in instant contact with all of his commanders via satellite communication. When Schwartzkopf discovered that both assaulting Marine divisions had penetrated and moved through the minefields far quicker than expected, he immediately ordered the northernmost assault unit, consisting of the 6th French Armored Division and the 7th British Armoured Division, accompanied by a brigade of the 82nd Airborne, to begin the assault into Iraq. Finally, at 0800 on the morning of the 24th, after a weather delay of some four hours, the 101st Airborne Division launched a long range air assault deep into Iraqi territory. The ground war was in full swing!

Goals achieved by all allied forces by the end of the day was significant and reassuring to senior military planners. The 1st Marine Division had accomplished its mission of taking Al Jabar airfield as well as the Al Burqan oilfield. With equal success, the 2d Marine Division, along with the Army's Tiger Brigade, had met an Iraqi armored column racing out of Kuwait City, and crushed it, taking over 5,000 prisoners.

The French 6th Light Armored Division, reinforced by a brigade of the U.S. 101st Airborne Division, engaged and destroyed the Iraqi 45th Division deep into Iraqi, then sped on to Salam airfield.

DAY 2...G+1 (25 FEBRUARY 1991)

On 25 February, occupying a new position at the head of the battalion column, Bravo Company located and identified a number of enemy vehicles in the area. An entire Iraqi tank battalion was running about 1800 meters to the east of their position. Within 90 seconds, Bravo Company had engaged and destroyed over 30 T-72 tanks, three T-55s, a T-62, and seven personnel carriers. After battalion TOW vehicles joined the melee, Iraqi survivors began to surrender, and in this engagement called the *Reveille Battle*, Bravo Company was credited with over 70 prisoners captured.

On 25 February, Bravo Company again engaged the enemy in a running battle under rain and smog conditions. While travelling at 20 MPH, elements of Bravo Company destroyed a T-62 tank and a BMP at a range of 2,000 meters. Despite receiving incoming mortar rounds, Bravo Company sought out the enemy again in adverse weather, in what came to be called the "Battle of the L," and destroyed an additional nine T-62s, 12 BMPs, three BTRs, one MT-LB, and four trucks.

DAY 3...G+2 (26 FEBRUARY 1991)

The 1st Marine Division took Kuwait International, and destroyed 250 T-55/T-62 tanks, and more than 70 T-72 tanks in the process. During this time, the 2d Marine Division took control of the city of Al Jahra, and moved to cut off the highways that lead in from the north and west to Kuwait City. The 5th Marine Regiment, acting as I MEF reserve, moved up to Al Jabar to help with prisoner control. Afloat, the 4th MEB made an amphibious demonstration against Bubiyan and Faylaka islands, which controlled the seaward approaches to Kuwait City.

DAY 4...G+3 (27 FEBRUARY 1991)

Later, at his famous *Hail Mary* press conference at Riyadh on 27 February, General Schwartzkopf described heavy tank battles involving Marines and Army forces. The Coalition forces had confronted an enemy armed with "4,700 tanks versus our 3,500 tanks," said General Schwartzkopf. At the same

time, the general told his audience that, of a total of "more than 4,000 tanks," the enemy "seems to have about 500-600 tanks left." Overall, General Schwartzkopf believed the coalition ground attack had destroyed over 3,000 tanks.

DAY 5...G+4 (28 FEBRUARY 1991)

On February 27, President George Bush announced the suspension of all combat operations with the official cease-fire in the Gulf War to go into effect at 0500, 28 February, 1991. By the end of the Gulf War, the Marine Corps could claim many important successes in armored warfare. When President Bush directed that offensive combat operations would cease on 28 February 1991, the CG, I MEF, indicated that for the 100 hours of ground combat action, the Marines had destroyed or captured 1,040 enemy tanks, 608 enemy armored personnel carriers, destroyed 432 enemy artillery pieces, destroyed 5 FROG missile sites, inflicted 1,510 enemy KIA, and captured over 20,000 enemy prisoners of war. This figure accounted for approximately 20% of the total Iraqi military force.

The Gulf War was perhaps the first truly 24-hours-a-day ground war in history. Advances in night vision equipment, including thermal imagery, now make it possible for U.S. ground units to fight nonstop unencumbered by darkness or weather.[76] Major Terrell, the Company Commander of a TOW Company in the 1st Tank Battalion described the significant battlefield advantages of thermal energy sights, "The state of the art thermal sights not only give you an advantage in seeing the enemy before he sees you, but they also allow you to maintain positive battlefield control, e.g., the thermal sights will allow you to make a positive identification of the enemy before firing. If we'd been in a much more close environment, I'd have never been able to control it--and wouldn't have wanted to. We would have had to loosen up, and we would, perhaps, have had more friendly fire incidents."

Obviously, there were many decisions about what armored forces to send to SWA, as well as many unanswered questions about the Iraqi use of the reputedly superior Soviet T-72 Main Battle Tank, and how the Marine Corps was going to meet that expected challenge. Lieutenant Colonel Buster Diggs, Commanding Officer of the 3d Tank Battalion, responded to the question, "The only thing we've got to do is when they come, we've got to close with them right away and take away the advantage they have of outgunning us. In close, we'll have more maneuverability, we'll have the sabot round, and we'll cause some problems."[77]

True to the prediction of LTCOL Diggs, Marines using this method of aggressive maneuver did score numerous catastrophic kills during Operation Desert Storm.

By 19 February, General Norman Schwarzkopf could report that Iraq's demoralized military machine was on the verge of collapse, and was losing about two battalions of tanks (or about 100) a day to allied air strikes. General Schwarzkopf said, "Iraq's military is hurting and hurting very badly...our assessment of them is that they are on the verge of collapse."[78]

In fact, Operation Desert Storm occurred with such unprecedented rapidity and intensity, that the astonished Iraqi army could only put up a token resistance before surrendering.

1. Friendly Fire Concerns

On the automated battlefield, where the high tech machines which populate it can boast of an uncanny capability to kill over the horizon unseen forces with incredible speed and accuracy, the likelihood of

friendly fire incidents can increase exponentially. The numbers of friendly fire incidents, which comprised a total of some 30 per cent of all casualties in the Gulf War, served to raise significant questions about the unique problems of vehicle identification on the modern battlefield where lightning quick decisions must be made. From the first such incident to the last known fratricidal incident among all American forces, the common thread of experience seemed to relate to factors of fog of war problems, poor visibility, breakdowns in communication, disorientation, and the accuracy and rapidity of modern technological weapons systems. One such incident, described by an unidentified Marine, suggests the multiplicity of reasons for fratricidal incidents, "The other friendly fire was all direct... In fact my three wounded Marines, all three were wounded by friendly fire... The smoke was very dense, and people weren't (doing) proper acquisitions, in my opinion. A TOW Humvee does not look like anything the enemy had, so people firing that up are kind of like deer hunters who shoot the first thing that moves."

Captain Robinson, Commanding Officer of B Company, lst Tank Battalion recalled a friendly fire incident that could have had serious consequences for all concerned except for the alertness of his crew, "We went through the fence at the airport at about 2230... We went through the fence with no resistance at all. Crashed the fence on the west side, about half way up. As we were setting into our defensive perimeter we received three HEAT rounds and two sabot rounds through the cracks into the positions. We did an action rear...

They (the unit firing at them) were stationary - the engineers were set, and they gave them M60A3 plow tanks and their TC saw us and fired us up. So we turned around and did an action rear; it was raining like hell, you couldn't see shit. It was about 2230, actually 2240 by this time. We put two platoons along the fenceline out of sight, pushed first platoon back out of the airport behind a berm with two sections of TOW. Set up an L-shaped (ambush) and they were starting to close on the L-shape.

The direction I gave the TOW platoon commander was to let 'em close to between a 1,000 and 1,500, so if it turned out to be the enemy, the 32s (the M60A1s passive sight) could pick them up -- we'd be able to engage with main gun...

The colonel called me up and said there are friendlies in the area, so he thinks it's friendly fire. I said 'Roger that.' And I also told him that for whoever's going against us, it's going to be OBE (overcome by events), because this guy's going to end up killing us.

We had the laser on him off the MULE, getting ready to surgically remove that vehicle with air. Plus TOW had him locked up. And again the thermal sight came through, because if we'd been going on passive sights, we'd have closed on them and we would have had an ever increasing problem.

Now some of the other A3 crews knew that there were amtracs, tanks and TOWs. But a couple of the crews, for whatever reason, kept firing us up. (The TOW platoon commander) called me, did a target I.D., says there's TOW Hummers down there. I reported back to battalion and said 'Get these guys off my ass.' The whole thing lasted maybe fifteen minutes."

Clearly, the few friendly fire incidents experienced by Marines in the KTO will result in increased research in methods of friend or foe identification, insistence on commonality of communication and battlefield tactics, and increased attention to training to offset the problems of battlefield orientation.

MARINE CORPS UNIVERSITY LIBRARY

VI. IRAQI'S MILITARY EQUIPMENT, STRATEGY, AND PERFORMANCE

A. General

When the Gulf crisis erupted, U.S. military planners were justifiably concerned about several aspects of Sadam Hussein's war machine. Those concerns focused on the size of the Iraqi army and its table of equipment, which included a nuclear weapons program; biological warfare capability; commendable artillery, antitank, and air defense systems; and a formidable air force.

B. Size

As the war in SWA began, Iraq possessed the fourth largest army in the world. Even though Iraq's population is only slightly over 16 million, it was able, using conscription, to field a force of more than 1 million men. The size of the Iraqi army was due largely to its war with Iran, and a continued post-war build-up of forces by Saddam Hussein.

I MEF planners estimated that the enemy's table of equipment included approximately 4,200 tanks, 2,800 armored vehicles, and 3,000 artillery targets for Marine combat forces, although it was impossible to precisely identify the number and types of Iraqi armored vehicles to be destroyed. MEF also identified large numbers of non-mechanized enemy targets, such as infantry installations, command and control sites, and logistic facilities. During the early phases of the war, it was estimated that there was a total of some 5,500 tanks in the Iraqi arsenal.

C. Strategy And Tactics

Senior Marine planners were also well aware that the Iraqi army was battle-tested, and had almost a decade of recent combat experience, following its war with Iran. Doctrinally, the Iraqis had adopted an amalgam of Soviet concepts, but relied heavily on their long experience with region-specific campaign tactics.

Over the years, the Iraqis had become masters of entrenchments, camouflage, and the flexible use of mobile reserves. Overall, their armored units were well trained in the techniques of mobility and speed on the battlefield, and practiced the strategy of the hard-hitting counterattack to stop infantry breaching movements.

Tactically, the Iraqi army admired flexibility, practiced leading with infantry units, then using armored forces to breach and destroy. Defensively, the Iraqis were known to emphasize the building of elaborate entrenchments and prepared positions.

Defensively, the Iraqis developed what has been described as a *linear defense*, which was a concept inspired and heavily influenced by Soviet military thinking. This linear defense relies on an integrated array of at least three defensive lines. Doctrinally, they strived to achieve high attrition rates by attacking their enemy's best units with the least effective defensive forces. The linear defense concept relies on an integrated array of at least three rigid (static) lines, integrated with tactical reserves, along with mobile or semi-mobile antitank arrays. The forward line of defense stretches up to one kilometer from the forward line of (defending) troops (FLOT).

But, Iraqi armor could not match the quality of U.S. armor equipment and tactics, despite their lengthy combat experience with Iran. Although the Iraqi armed forces were equipped with a wide table of equipment, which included an imposing array of Soviet equipment, they were at least a generation behind the American forces in weapons development.

Despite their large table of equipment, the Iraqi military lacked state-of-the-art equipment such as that possessed by U.S. forces. Because the Iraqis did not have thermal sights, they were blind at night, and often during the day because of the blackout conditions caused by the black pall of smoke from burning oil wells ignited by their own troops.

Captain Dennis Greene, A Company, 2d LAI Battalion, expressed his disdain for Iraqi gunnery skills, "Well, I think in a lot of ways we were lucky... The Iraqis were real poor gunners; their tank gunnery skills just stunk. We could hit them at 3,000 meters with our main gun (25mm) -- sabot. And they'd shoot at us with tanks at 3,000 meters, and they couldn't hit us with tank fire, which is inherently more accurate. Bigger round, more stable than these (25mm) sabot rounds -- they couldn't hit us. There's a lot of reports -- Charlie Company had some -- pretty close encounters with tanks, and they just couldn't hit people.

Reading a lot of these EPW reports from some of these senior officers -- these guys hadn't trained since August, when they got here. They were stagnant; they hadn't done a damn thing. So I think gunnery plays a big part... They gave a good effort and they came pretty close a few times, but they never hit us."

During the Gulf War, U.S. Marine Corps armored units faced a wide variety of Iraqi armored vehicles. Among them the aging T-55 Main Battle Tank. Though its design had revolutionized armored warfare over the 1950s, with its inexpensive mass produced frame combined with the armament and firepower of a heavy tank, it could only be pitted against infantry and light mechanized forces in today's technologically advanced armor era. The Iraqis had approximately 2,500 basic T-55s and 1,500 Chinese T-59's, (actually modified T-55s) in their arsenal. A second type of armored vehicle in the Iraqi inventory was the approximately 1,000 T-62 Main Battle Tanks, which were not especially powerful, using a 115mm gun with effective accuracy to 1200 meters.

Of all the weaponry systems in the Iraqi table of equipment, the Soviet T72 Medium Battle Tank was the most heralded among Marine tank forces, but actually accounted for less than 10% of the total estimated armor vehicles in the Iraqi inventory. The table below illustrates the frequency of engagement with Marine tank forces in SWA: (NOTE: The most frequently engaged MBT's are listed first)

MEDIUM BATTLE TANKS

1. Type 69
2. T-54/55
3. T-62
4. T-72

In sum, the Iraqis never demonstrated the capability or the willingness to attempt to match the advanced weaponry and superior skills of the Marines. Despite having purchased large blocks of arms from the Soviets, the Iraqi army ultimately failed because of three major factors: first, they displayed a definite

unwillingness to fight; second, they were unable to maintain logistic lifelines to their military forces; and third, they did not possess the technical skill to both operate or maintain the sophisticated equipment they had purchased.

VII. LOGISTICAL SUPPORT ISSUES

A. General

Both planners and participants in the Persian Gulf War acknowledge that logistics wins wars.

The presence of proximate logistics bases proved to be one of the most dominant advantages enjoyed by Marines and other allied military forces during the Gulf War. Insightful analysts also believe that to maintain that advantage in future conflicts, the United States must depend heavily on its allies for strong logistic support. This is particularly true when one considers the demise of the outmoded U.S. forward-deployed presence policy.

Despite the global view of an overall success story in logistical support issues, some Marine armored units in SWA had another less benevolent perception of logistical support which they viewed through the prism of desert cold and dust. Examples of the problems which they faced were lack of spare parts, limited quality control of spare parts, and interruption of Marine Corps Integrated Maintenance Management System (MIMMS) procedures.

During interviews with MEF veterans of the Gulf War, concern was frequently expressed that had Iraqi military forces been more aggressive in their defense, the lack of equipment, spare parts, and the frequent need to improvise modifications on their armored vehicles would have held disastrous consequences for Marine armored units.

1. Fuel Issues

Captain Altermatt, C Company, lst Platoon, 8th Tank Battalion expressed great surprise over unexpected fuel constraints, "...I always believed as we got closer and closer to combat that the floodgates would open and the (gear) they were saving for some special purpose would come out - and issue at least one set of NVGs per tank and get the damn binoculars out there, and it just never happened... And those are just the basics..."

"Well you know how it is back from running CAXs, they always say, 'Put your 4-cards in, make sure your EROs are open; we've got to make the system work'. 'Make the system work' is always the catchword phrase you always hear. So you always do that. And you go through CAX after CAX and the same shit happens - you put (something) on order and it doesn't happen until you're ready to go home... But the bottom line is 'That's good; we're getting usage data. It'll be there when you need it.' Well it's just like a ... CAX again. You put stuff on (order), and the fill rate was zero."

"I had no stabe for the whole war. I checked my tank out on the first day at the tank park, and the rate sensor valve was bad. We put it on order that...day. Went to war without a stabe; the thing never came in. One of the other platoon commanders had no ballistic computer - How can you go to combat without a computer?... It's not like suddenly we were thrown in combat...we had a couple months, and those parts just weren't coming."

"I know those parts are sitting back at the reserve center. I could go back to Syracuse right now, and there are seventeen tanks sitting back there that are in generally fantastic shape...They could have outfitted this whole battalion just from the (gear) we have sitting back there..."

"It just seemed that somewhere along the line a link wasn't made...(no one) said 'The supply system's not working. Let's put it aside for the time being, and get the parts they need. Then later on we can get the parts system to reconcile and find out why we couldn't do it through the system'."

"I was chuckling to myself the night before - I can't believe this is it. We're here on the Saudi berm; this is it. We're loaded for bear, and tomorrow morning we're supposed to face the hordes and, you know, I got no stabe, and I don't got a lot of other things too. It just sorta made you shake your head and say, 'Well, I hope somebody asks me about this later on, because I will tell 'em.'"

2. Supply/Re-Ordering Equipment

In addition to fuel issues, the reordering of equipment caused concern for some tank units. Master Sergeant Martin, First Sergeant of Bravo Company, 4th Tanks considered the logistic support for the M1A1, "...a nightmare from day one. I believe the M1A1 cannot be properly supported utilizing wheeled vehicles such as HMMWVs and 5-Tons. We came dangerously close to a hot refueling situation with maintenance being done while we were receiving POWs surrendering."

Martin suggested another that if refuelers were available, there would be considerably more mobility for all mobile units, "Four twelve-hundred gallon tracked refuelers would support this type of scenario much better especially if they could run back to the refueling points independently of battalion."

Major Terrell, a TOW Company Commander in the lst Tank Battalion agreed, "Once the war started we did not get a single part... The biggest problems were the TOW night sights. They are a relatively delicate system. We lost, by the time the war was over -- I had twelve of my ninety-six down, which is a significant amount."

"Especially significant in that they were such a valuable piece of gear. It was very frustrating -- I'd send them back on the nightly resupplies -- I'd send them back to my maintenance and they'd try to get them floated out, but there was no float."

3. CVC Gear

Master Sergeant Martin believes that support should be supplied by tracked vehicles, "...all support should be delivered using tracked vehicles, including tracked infantry. I believe the tank company must operate logistically in an independent fashion from that company."

Martin considered this a particular problem in fast moving situations, "Several times, as we moved forward to resupply the tanks, we were confronted with cluster bombs anti-tank bombs, or mines."

4. Ammo Allowances

Captain Holbert recalled that Marines in the desert felt that they should determine ammunition carrying capability, rather than adhering to a ordnance allowance publication based on theory, "I want to clarify something with the 8010 (the allowance publication for ordnance) though. The rate for ammo is a planning factor. One DoA is not necessarily one day of ammunition. If I come in and I want four DoA -- two sabot rounds is a DoA -- I should be the one to determine what I think is going to be my carrying capability going into combat. Obviously I'm going to shoot more than two sabot rounds a day... We've got too many people hung up on 'If the 8010 says two rounds is all you get a day, then that's all you

get.' From the time I got here until about three weeks prior to going into the war, I was fighting ammo issues. I had the capability to carry the ammo."

4. MPS Off Load

Captain Lloyd Holbert gave a graphic description of the frustration in looking for needed equipment, "My supply officer, in one day, in one compound, driving up and down, looking just for MilVans, put something like 15 miles on a Humvee... When they're off-loaded, they're off-loaded out of order, and (with) no packing list on the MilVans...you've got to open it up, pull things out, to find what you're looking for..."

Major Heimblen also compared the logistical problems which arose in trying to arrange civilian transportation, "I have to have Heavy Equipment Transports. We don't have them. One of the biggest problems we had was getting civilian transports to haul us long distances. It was a logistical nightmare... We have to have HETs. The Saudi government has their own HETs, the Brits brought their own HETs, the Army has their own HETs. And we're dependent on civilian stuff that you might use for a good farm truck but you wouldn't put it on the highway. And we're putting tanks on 'em, and hauling them for miles."

VIII. U.S. MARINE CORPS RESERVE PERFORMANCE

A. General

One of the most remarkable success stories to emerge from the Gulf War was the aggressive and highly disciplined performance of members of the U. S. Marine Corps Reserve (USMCR). Out of more than 31,000 Marine Reservists activated for service in the Gulf Crisis, some 13,000 were actually deployed to Southwest Asia. Reservists served in all elements of the MEF and eventually comprised a significant level of 15% of the total Marines in theater.

Although the modern Marine Corps has undergone many changes in order to adapt to the nation's changing strategic and tactical needs, an unstable international security environment has required that the reserve components of the U.S. military force maintain a high level of readiness for expeditionary service, and to be prepared to accept a larger role in defending freedom around the world, should the challenge arise. The very existence of the Marine Corps reserve has historically provided a strong foundation for sustainability of the Marine Corps, through reserve force mobilization.

Despite the rapidity of the mobilization of the Marine Corps Reserves in the Gulf War, regular Marines responsible for integrating mobilized Marines into deploying units rated them extremely high in terms of maturity, motivation, dedication, and skill. In fact, during the Gulf War, one Marine reserve tank unit, the 8th Tank Battalion, actually spearheaded the 2d Marine Division attack, and was responsible for a significant number of enemy kills during the war.

However, the experience gained during the Gulf War seems to demand a fresh review of the total force policy of integrating Marine reserves into combat. A number of reserve implementation problems did emerge. These problems centered around pre-deployment training time, limited equipment, and overburdened regular host units, who were tasked with prepping reservists for deployment concurrent with their own pre-deployment activities.

Deployed reservists did feel that their most significant training shortfall was a lack of combined arms training, and that they do not function well in units larger than company/battery. Their explanation for this shortfall is that they drill and train almost exclusively at the company/battery level and have little appreciation for the way in which their units fit into the larger whole. It was generally accepted that reserves, used to working more independently, needed additional time to learn to operate as a team within a higher organization. Once that integration took place, members of the USMCR performed in an exceptional manner.

Generally, most Marine reserve units had limited time to prepare for engagement after deploying to SWA. Some reserve units, anticipating their mobilization, had designed an aggressive and effective pre-deployment training plan. One such plan was described by Captain Peter Gutensohn, platoon commander of Delta Company, 4th LAI, a reserve unit based at Camp Upshur, Quantico, "We did a lot of individual studies on the area, doing extra drills on tactics, immediate actions, and crew drills that we were going to train. We came up with an intensive 30 day training plan to prepare the unit after we got called up, before combat. Generally, we were well prepared when we were called up."[79]

After arriving in SWA, CAPT Gutensohn discovered that he had extra vehicles, beefing up his battalion's overall strength, "We were actually a strong battalion for LAI. As an organization, we generally have 3 line companies and a weapons company. When we fielded, we had 6 line companies and a heavy TOW platoon which is essentially a company."[80]

The need for more consistent *hands-on* proficiency training in mechanized vehicles, while reducing time spent on basic warrior training, was expressed by Major Carlton, Executive Officer, 2d Tank Battalion. Major Carlton said, "I believe we are approaching a time constraint on how much time can be dedicated to doing basic warrior training, then going to a tank that is so technically advanced that if you don't stay up with and train withit, you're going to make mistakes."[81]

Other regular Marines were cognizant of the difficulties surrounding a rapid mobilization of Marine reserves, but still expressed confidence in their presence in SWA. Lieutenant Colonel J. C. Hardy, Executive Officer of the 8th Marines, said of the reserves, "You have to look at their performance on two levels: the Macro level and the micro level. In the macro sense, the reserves did very well; to my knowledge, the Army did not utilize their reserve infantry, artillery, and armored units in the Ground campaign; the Marine Corps did! Their attitude was superior...no units could have been more enthusiastic and motivated. On the micro level their shortcomings were in the training area, especially at the Battalion level."

Clearly, the Marine Corps must continue to look to the reserve components to support the active duty units, but clearly, many changes need to be made, changes which will require a change in training. These training modifications will focus on how reserve units fit into active duty units in the event of mobilization, more realistic training scenarios, and more stringent adherence to unity of purpose as well as adherence to the total force concept.

IX. NUCLEAR, BIOLOGICAL, CHEMICAL

A. General

Many Marines interviewed after the Gulf War recalled that the lack of NBC training before they deployed was a matter of great concern to them, and that they arrived in country poorly prepared to fight in a chemical environment. Once Marines were in Southwest Asia, they did receive comprehensive NBC training. Many Marines also expressed their concern about the requirement to change mask filters after four hours and protective suits within 24 hours.

Specific equipment concerns were also voiced among MEF personnel. They felt that they needed a protective mask that is both full faced for weapon sighting purposes, which allows immediate (20 seconds or less) filter replacement while in a contaminated environment. Tank crewmen require a mask with a full-field of vision, allows water to be consumed, and is still effective when unplugged from the vehicle NBC system.

Because Iraq had used toxic gases in their war with Iran, 2,300 allied military doctors were given special training in chemical defense. Although the threat that Saddam Hussein had biological weapons, primarily in the form of anthrax and botulism, never occurred, U.S. military forces still prepared for the possibility that biological weapons might be used against American forces.

More specific procedures for the decontamination of casualties prior to entering the Medical Evacuation (MEDEVAC) chain need to be implemented, because current evacuation procedures are incomplete as they relate to handling casualties in a contaminated environment.

While many Marines had little confidence in their ability to meet an NBC threat upon their arrival in SWA, dedicated NBC personnel persisted in helping Marines learn to survive and to fight in an NBC environment. As the training was conducted, the Marine's confidence in their ability to survive and defeat the Iraqis increased.

X. CONCLUSIONS

In almost every way, the Gulf War was unique. With unprecedented ease, the United States and other coalition nations dominated the entire air and land campaigns in Southwest Asia (SWA), from the beginning of the conflict in August, 1990 to the cease fire in February, 1992. A variety of conclusions emerge from our study of armor and anti-armor in SWA. Perhaps the central finding is that the overwhelming successes enjoyed by allied forces, including the U.S. Marine Corps, must be viewed cautiously if lessons of the conflict are to be extrapolated to future battles. In addition to a discussion of the implications of the employment of specific armored vehicles, the preceding sections have attempted to outline the character of Marine Corps armor in Southwest Asia by providing a brief background of armored warfare; an overview of USMC operations in SWA (including training, logistics, USMC reserve employment, NBC concerns, and the tactical environment); an examination of Iraqi military equipment and performance; and representative events which characterize the Marine armor ground operation.

Such subjects are not finite topics with which to understand armor in SWA. In fact, there is considerable latitude for the study of USMC armor in the Gulf War, depending on ones interest. The only certainty about tank warfare in SWA is that it is controversial, in terms of strategy and employment. But, the controversy alone is important to enliven discussion and debate about future armor tactics, 2.

2. Training Is Necessary For Battlefield Success

Despite the advances in new technology available to Marine armor in SWA, overall effectiveness in battle would not have been achieved without well-trained Marines. The corollary of this experience was evident in the Iraqi army. Although much of their equipment was purchased from the Soviet Union, the Iraqis were incapable of both operating and maintaining those high tech systems which were dependent on Soviet high technology.[82]

Additionally, modern military analysts also have realized that the value of each member of a military force has increased in proportion to the training required of them to keep pace with the exponential advances in battlefield technology.

3. NBC Equipment Requires Review For Desert Scenario

Overall, numerous Marines considered their NBC training prior to arrival in SWA to be ineffective, and did not equip them to properly operate in a chemical environment. Increased NBC training, according to these Marines, is absolutely mandatory, particularly after facing an enemy which threatened, but did not carry out its threat to use large scale chemical warfare.

Numerous Marine Expeditionary Force personnel also expressed a need for a protective mask which is full-faced for ease in weapons sighting, and permits filter replacement in 20 seconds or less. Combat vehicle crewmen also called for an improved mask which would provide a full field of vision, permit clear verbal communication through the CVC helmet, allows the wearer to drink water through the mask, and is effective when not plugged into the vehicle NBC system.

Some Marine armored vehicle crewmen also experienced difficulty with the velcro closures on their protective suits and suggested that a replacement is necessary. Additionally, some Marines in 3rd Tanks suggested that a balaclava be used in an intemperate climate such as SWA. The balaclava not only provided warmth but also inhibited dust ingestion.

4. USMC Reserves Performed Well, But Needed Additional Time To Integrate Into Larger Units

Marine Corps Reserve components served with distinction throughout Operation Desert Storm, but additional study should be devoted to techniques of integrating the reserve components into the larger whole of a combat element. The reserve units ability to function above the company/battery level was widely recognized as a shortfall. The Reserve Battalion staffs were identified as being slow in gaining experience and expertise. The reason for this difficulty lies in the fact that most reserve training is focused on the company/battalion level. Most units of this size have little appreciation for how the unit fits into the larger whole. This emphasis on small unit training has led to deficiencies in understanding combined arms and the functioning of the battalion staff.

5. Ease Of Victory In The War May Be Deceiving

The factors which comprised the tactical situation in SWA are totally unique. In sum, the enemy defeated by the coalition forces was a heavily armed third world force. Though the Iraqis may have been large in terms of materials and men, they presented a World War I defense to a force that prides itself on its capability to fire and maneuver at both the tactical land operational level. The Iraqis were also suffering from a crisis in leadership and morale throughout their military and national structure, a vulnerability exploited by airpower, the threat of an amphibious assault to their rear, and two lightning attacks from its south and west.

If the Iraqis had offered greater resistance, or had employed chemical weapons, the entire operation surely would have changed. Therefore, before we rely on the same tactical scenario for future operations, care must be taken to avoid complacency. On the contrary, the Marine Corps must broaden its base in combined arms operations, widen its experience in scenarios in which coalition forces are teamed with Marines, and increase training requirements for Marines to keep pace with increased technology.

6. Poor Visibility On The Battlefield Lowers Effectiveness Of Marine Gunners

Target location and identification Friend-or-Foe (IFF) was extremely difficult due to the limited visibility caused by smoke from burning wells. Additionally, the lack of recognizable terrain features caused many weapons operators to become disoriented. In order to improve the ability to acquire and identify targets in low visibility environments, laser and compass capabilities should be incorporated into tank, LAV, and TOW weapons systems. The retrofit of a compass in combat vehicles would allow the operators to be aware of direction while on the move and would aid in maintaining proper orientation in battle.

A. Recommendations For Ground Operations

1. Combine laser and compass capabilities into weapon sights (thermal and day) on tanks, LAVs and TOWs.

2. Retrofit a compass in tanks and AAVs. Currently, a crewman must dismount the vehicle and shoot an azimuth with a hand-held compass.

3. Retrofit AAVs with a thermal capability for the driver and gunner. If the AAV is expected to operate in tandem with the M1A1 the crews must have the same visual and target acquisition capabilities.

4. Develop a simple HMMWV mount for the Dragon. In many regions of the expeditionary environment, use of the TOW will be restricted and the Dragon will fill this void.

5. Procure Depleted Uranium (DU) ordnance for the 25mm gun on the LAV-25. Although still not a reliable tank killer, this ordnance is effective at extended ranges against modern infantry fighting vehicles. This capability would be important as the MAGTF is likely to be employed in areas of the expeditionary environment in which deployment of heavy armor would not be appropriate.

In the beginning, tanks were viewed as mere "mechanical toys", unreliable and awkward on the field of battle. While man's inability to foresee the importance of adapting to change tends to cost precious lives in combat; the armor lessons learned in SWA now has the potential to direct doctrinal, technological, and training development in tomorrow's U.S. Marine Corps toward a more accurate prediction of the form the battlefield of the future will take.

APPENDIX A

GLOSSARY

AAV	Assault Amphibian Vehicle
AAWS-M	Advanced Antitank Weapon System-Medium
ATGM	Antitank Guided Missile
BZO	Battle Sight Zero
CENTCOM	Central Command
CSS	Combat Service Support
CSSE	Combat Service Support Element
DF	Direction Find
EDWS	Electric Drive Weapon System
EPW	Enemy Prisoner of War
EW	Electronic Warfare
FLIR	Forward Looking Infrared
FSCL	Fire Support Coordination Line
GCE	Ground Combat Element
GPS	Global Positioning System
IFF	Identification Friend-or-Foe
INS	Inertial Navigation System
IPB	Intelligence Preparation of the Battlefield
IR	Infrared
JSTARS	Joint Surveillance Target Attack Radar System
KTO	Kuwait Theater of Operations
LAAW	Light Antiarmor/Assault Weapon
LAI	Light-Armored Infantry
LASER	Light Amplification by Stimulated Emission of Radiation
LAV	Light-Armored Vehicle
LAV-AT	Light-Armored Vehicle-Antitank
LOS	Line-of-Sight
MAGTF	Marine Air-Ground Task Force
MACV	Military Assistance Command Vietnam
MBT	Main Battle Tank
MEF	Marine Expeditionary Force
MULE	Modular Universal Laser Equipment
NBC	Nuclear, Biological, and Chemical
NVA	North Vietnamese Army
PLRS	Position-Location Reporting System
SA/SAM	Surface-to-Air Missile
SMAW	Shoulder-Launched Multi-Purpose Assault Weapon
SWA	Southwest Asia
TOW	Tube-Launched, Optically Tracked, Wire-Guided
UGWS	Up-Gunned Weapon Station
WP	White Phosphorous

APPENDIX B

GEOGRAPHICAL GLOSSARY

Arabian Peninsula
Baghdad
Cambrai
Candy Cane
Czechoslovakia
Da Nang
Egypt
France
Guadalcanal
Hue
Hungary
Inchon
Iraq
Korea
KTO (Kuwait Theater of Operations)
Kuwait
Kuwait City
Mesopotamia
Naktong River
Persian Gulf
Syria
Vietnam
Obong-ni Ridge
Pusan
Saudia Arabia
Southwest Asia
Zagros Mountains

APPENDIX C

INDEX OF NAMES IN THIS REPORT

CAPTAIN Altermatt, lst Plt C Co, 8th Tanks
COL P. J. Blessing
President George Bush
COLONEL John S. Caldwell, Jr.
MAJOR Carlton
Dr. Keith Fleming
CAPTAIN Jim Flowers
GENERAL John W. Foss, CG of Army's Training and Doctrine Command.
LT Chris Fraitis, XO, C CO, 3rd Tanks
CAPTAIN Peter Gutensohn, Platoon Commander of Delta Company, 3rd
LTCOL J. C. Hardy, Executive Officer of the 8th Marines
MAJOR Holbert
Saddam Hussein
LAI
Peter Jennings, ABC-TV Correspondent
GENERAL Norman Schwarzkopf
CPL Theemy
Bob Zelnick, ABC Pentagon correspondent

BIBLIOGRAPHY

BOOKS

Bailey, J. R. A. *Field Artillery and Firepower*. Oxford: Praeger Press, 1959.

Barnaby, Frank. *The Automated Battlefield*. New York: The Free Press, 1986.

Blackwell, James. *Thunder in the Desert: The Strategy and Tactics of the Persian Gulf War*. New York: Bantam Books, 1991.

Bowman, John S., ed. *The World Almanac of the Vietnam War*. New York: Pharos Books, 1985.

Crow, Duncan, ed. *American AFV's of World War II, Vol. IV, Armoured Fighting Vehicles in Profile*. New York: Doubleday, 1972.

Gudgin, Peter. *Armour 2000*. London: Arms and Armour Press, 1990.

Fuller, J. F. C. *Tanks in the Great War*. London: Murray Press, 1920.

Hogg, Ian V. *Modern Military Techniques: Tanks*. Minneapolis: Lerner Publications Company, 1985.

Liddell Hart, Basil H. *The Tanks*. New York: Praeger Press, 1959.

Documents

Burns, Arthur E. III. "The Origin and Development of U.S. Marine Corps Tank Units: 1923 - 1945." Unpublished Manuscript, Marine Corps Command and Staff College, 1977.

FOOTNOTES

[1] Kenneth Macksey and John Batchelor. Tank Warfare: A History of Tanks in Battle. (New York, N.Y.: Salem House Publishers, 1986), p. 101.

[2] ....., Tank versus Tank. (Topsfield, MA: Salem House Publishers, 1988), pp. 5-8.

[3] Peter Gudgin, Armor 2000. (London: Arms and Armor Press, 1990), p. 6.

[4] Richard M. Ogorkiewitz, Armoured Forces: A History of Armoured Forces and their Vehicles. (New York: Arco Publishers, 1970), p. 190.

[5] J. F. C. Fuller, Tanks in the Great War. (London: Murray, 1920), p. 12; C. R. M. Messenger, "Mobility on the Battlefield," p. 25 in The Mechanized Battlefield: A Tactical Analysis. (New York: Pergamon-Brasey's, 1985), Major Messenger's article provides a thoughtful analysis of the evolution of mobility on the battlefield, and the acceptance of the concept of mobility as an integral part of modern warfare.

[6] Macksey, Tank versus Tank, pp. 19-21.

[7] For a description of the German response to the "Tank" as an offensive weapon, see Macksey, Tank versus Tank, p. 18; Ian V. Hogg, Modern Military Techniques: Tanks, (Minneapolis: Lerner Publications Company, 1985), pp. 12-15; a lucid and intelligent explanation of how Germany led in anti-tank ordance, ostensibly in response to their devastating World War I experience, is provided in J. R. A. Bailey's Field Artillery and Firepower, (Oxford: Praeger Press, 1959), p. 127.

[8] Basil H. Liddell Hart, The Tanks. (New York: Praeger Press, 1959), p. 127.

[9] Ibid., p. 127

[10] Ibid., p. 127; Messenger, "Mobility on the Battlefield," in The Mechanized Battlefield: A Tactical Analysis., p. 26, previously cited.

[11] Major Arthur E. Burns, III, The Origin and Development of U.S. Marine Corps Tank Units: 1923-1945. (Unpublished Paper for Marine Corps Command and Staff College Education Center, Quantico, Virginia, 1977). This study is a well reserached investigation of the development of Marine armor during a pivotal stage in armed forces history. Major Burns emphasizes the cause-effect relationship of operational change, and points out how Marine armor was developed in concert with the development of amphibious doctrine.

[12] Ibid., p. 43

[13] Ibid., p. 53; Duncan Crow, ed. American AFV's of World War II, Vol IV, Armoured Fighting Vehicles in Profile, (New York: Doubleday, 1972), pp. 54-58; p. 151; 1st Marine Division Report on Gilbert Islans-Tarawa Operation, 23 December 1943 (Breckinridge Library-Marine Corps Command and Staff college).

[14] Burns, Op Cit., p.56; Henry I. Shaw, Jr., Bernard C. Nalty, and Edwin T. Turnbladh, Central Pacific Drive, Vol. III, History of U. S. Marine Corps Operations in World War II (Washington, D.C.: USGPO, 1966), pp. 284-287. This study of pivotal tank operations in the Pacific War underscores the importance of tank support in the Pacific, but also vividly describes that often dismounted reconnaissance by tankers allowed tanks to operate in virtually impassable jungles.

[15] Jim Mesko, Armor in Korea, (Carrolton, Texas: Squadron/Signal Publications, Inc., 1984), p. 31.

[16] Ibid., p. 31

[17] Donn A. Starry, Armored Combat in Vietnam. (New York: Bobbs-Merrill Company, 1980), p. 51.

[18] John S. Bowman, ed. The World Almanac of the Vietnam War. (New York: Pharos Books, 1985), p. 377. This work provides an extremely valuable annotation of critical events of the Vietnam War.

[19] Ibid., p. 124

[20] Starry, Op Cit., p. 54.

[21] Bailey, Op Cit., p. 159.

[22] Frank Barnaby, The Automated Battlefield, (New York: The Free Press, 1986), pp. 1-9.

[23] David Rosser-Owen, Victnam Weapons Handbook. (Wellingborough, England: Patrick Stephens Limited, 1986), pp. 76, 77, 86-9.

[24] Mary Ann Teatreault, "Kuwait: The Morning After," 32, in Defense Journal, August, 1991.

[25] James Blackwell, Thunder in the Desert: The Strategy and Tactics of the Persian Gulf War. (New York: Bantam Books, 1991), p. 104. An extremely readable and balanced account of the Gulf War by a well respected military analyst. After providing an insightful history of American interests in the region, the author vividly draws a portrait of the personalities of the military and political leaders who led their respective forces during the Gulf War, and graphically captures the mood of the world as the War unfolded.

[26] eds., The Marine Corps Gazette, July 1990, p. 5.

[27] BGEN Edwin H. Simmons, "Getting the Job Done," in Proceedings/Naval Review, 1991, pp. 94-96. Excellent narrative of key Marine Corps events during the Gulf War.

[28] Louis G. Caporale, "Marine Corps Historical Notes From the Gulf War," in Marine Corps Gazette, December, 1991, pp. 44-46.

[29] Blackwell, Op Cit., pp. 00-100.

[30] eds., James Blackwell, Michael J. Mazarr, Don M. Snider, The Gulf War: Military Lessons learned/Interim Report of the CSIS Study Group on Lessons Learned from the Gulf War, (Washington, D.C.: The Center for Strategic and International Studies, 1991), pp. 12-13.

[31] Blackwell, Thunder in the Desert, Op Cit, pp. 114-5.

[32] Ibid

[33] Simmons, "Getting the Job Done," p. 94, previously cited in Proceedings/Naval Review, 1991.

[34] Alonzo W. Pond, Afoot in the Desert, (Maxwell Air Force Base, Alabams: Air University, 1956), pp. 3-4. Republished by U.S.M.C. in 1990 as FMFRP 0-53.

[35] Ibid., pp. 12-16

[36] Ibid., pp. 29-30

[37] Ibid., pp. 12-19

[38] Interview with MGEN William Keys in Proceedings/U.S. Naval Institute, November 1991, p. 77.

[39] Blackwell, Thunder in the Desert, Op Cit., pp. 121-9.

[40] Current News Supplement, 26 December 1991. Published by American Forces Information Service, Washington, D.C.

[41] Colin Nickerson, editorial, Boston Globe.

[42] J.M. Myatt, MGEN, U.S.M.C. in Marine Corps Gazette, November, 1992.

[43] Myatt, Op Cit.

[44] David Eshel, "Fighting in a Desert Environment," in Marine Corps Gazette, November, 1990.

[45] Ibid.

[46] Interview with 1st Lieutenant Chris Fraitis, Executive Officer, C Company, 3d Tanks by the Battle Field Assessment Team on.

[47] Ibid, Interview with 1Lt. Fraitis.

[48] eds., Marine Corps Gazette, February, 1990, p. 6.

[49] Interview (Tape # 5). Interview subject unidentified.

[50] Ibid., Battlefield Assessment Tape #5.

[51] Current News Early Bird, February, 1992.

[52] Colonel James Caldwell, writing in Marine Corps Gazette, March, 1991.

[53] Interview, Battle Assessment Team interview with CAPTAIN Jim Flowers.

[54] Ibid.

[55] Interview, unidentified Marine Tank Crewman from C Company, 8th Tank Bn on Battle Assessment Tape.

[56] Interview by Battle Assessment Team with SGT O'Neil, TOW Company, 3d Tank Battalion.

[57] Ibid., O'Neil, Battle Assessment Tape Interview.

[58] Ibid.

[59] Interview, MAJ Terrell, TOW Company Commander, lst Tank Battalion, Battle Assessment Tape.

[60] Ibid, Battle Assessment Tape interview with MAJ Terrell.

[61] Ibid., interview with MAJ Terrell, Battle Assessment Tape.

[62] Ibid.

[63] Battle Assessment Team interview with Captain Protzeller, Company C Commanding Officer.

[64] Interview, Captain Peter Gutensohn, Platoon Commander of Delta Company, 3d LAI. Battle Assessment Tape interview

[65] Ibid.

[66] Interview, Battle Assessment Tape-LT Chris Fraitis, previously identified.

[67] Interview, Battle Assessment Team interview with CAPT Lloyd Holbert,

[68] Battle Assessment Team interview with Members of the lst Platoon, 8th Tank Battalion:

[69] Interview, LT Chris Fraitis, Battle Assessment Team interview, previously cited.

[70] Interview, Corporal Theemy, 2d Platoon, TOW Company of the 3d Tank Battalion by Battle Assessment Team.

[71] Ibid.

[72] Ibid, Theemy interview.

[73] Blackwell, Op Cit., p. 168.

[74] Early Bird, March 1, 1991.

[75] Army, p.2, January, 1992.

[76] Blackwell, Op Cit., p. 18.

[77] Supplement, 22 November, 1991.

[78] Early Bird, 20 February, 1991.

[79] Battle Assessment Team interview with Captain Gutensohn by Colonel P.J. Blessing and Dr. K. Fleming.

[80] Ibid.

[81] Battle Assessment Team interview with MAJ Carlton, Tape number 1341.

[82] Blackwell, Op Cit., p. 118.

DS 79.72 .083 1993
Osborne, Robert E.
Sand and steel

DATE DUE			

MAY 15 1998

MARINE CORPS UNIVERSITY LIBRARY
2040 Broadway Street
Quantico, VA 22134-5107